



THE MEMPHIS DEPOT TENNESSEE

ADMINISTRATIVE RECORD COVER SHEET

AR File Number 104

Part II of II

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic			
			SFI	EPC	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	2.03E-05	4.28E-05	7.63E-09	1.55E-09			1.17E-08
ug/m3	1,1,2-TRICHLOROETHANE	C	5.60E-02	1.19E-04	2.12E-08	1.19E-09			3.26E-08
ug/m3	1,1-DICHLOROETHENE	C	1.75E-01	4.20E-03	7.48E-07	1.31E-07			1.15E-06
ug/m3	1,2-DICHLOROETHANE	B2	9.10E-02	1.56E-04	2.78E-08	2.53E-09	1.40E-03	4.27E-08	3.05E-05
ug/m3	BROMODICHLOROMETHANE	B2		1.23E-04	2.19E-08			3.37E-08	
ug/m3	CARBON TETRACHLORIDE	B2	5.25E-02	4.19E-03	7.47E-07	3.92E-08		1.15E-06	
ug/m3	CHLOROFORM	B2	8.05E-02	6.03E-04	1.07E-07	8.64E-09	0.00E+00	1.65E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D		5.50E-04	9.79E-08		1.00E-02	1.51E-07	1.51E-05
ug/m3	METHYLENE CHLORIDE	B2	1.65E-03	3.67E-04	6.54E-08	1.08E-10	8.57E-01	1.01E-07	1.17E-07
ug/m3	TETRACHLOROETHYLENE(PCF	C-B2	2.00E-03	2.21E-03	3.93E-07	7.87E-10	1.71E-01	6.05E-07	3.54E-06
ug/m3	trans-1,2-DICHLOROETHENE			1.27E-03	2.26E-07		2.00E-02	3.48E-07	1.74E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	1.38E-03	2.46E-07	1.47E-09		3.78E-07	

Total ELCR: 1.86E-07

Total HI: 0.0001

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	CDI _{adj} =	$\frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$
C _{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR _{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds.		Age-specific intake (for carcinogenic compounds only).	
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	CDI _{adj} =	$\frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$
C _{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm ²)	N/A	20000 b,c
SA _{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:CDI = Ingestion CDI from above^f**References:**

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSGI	PC	Ingestion CDI	ELCR	Dermal CDI	ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	1.93E-01		1.89E-06		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	4.46E-05	7E-05	4.36E-10	2E-09	
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	1.49E-03		1.45E-08		
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	1.04E-05		1.02E-10		
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	2.97E-05		1.82E-09		
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	2.97E-04		1.82E-08		
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	2.97E-04		7.27E-09		
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	2.97E-04		2.91E-09		
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	1.49E-04		3.65E-11		
MG/L	MANGANESE	D				2.00E+00	4.00E-02	1.60E-04	2.97E-02		2.91E-07		
MG/L	MERCURY	D				1.00E-04	1.00E-04	1.00E-03	1.49E-06		9.09E-11		
MG/L	NICKEL	D				1.00E-02	2.70E-01	1.00E-04	1.49E-04		9.09E-10		
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	2.23E-01		2.18E-06		
MG/L	VANADIUM					4.00E-02	1.00E-02	1.60E-04	5.95E-04		5.82E-09		
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	1.61E+01	6.00E-05	5.00E-01	1.60E-02	8.92E-07	1E-05	8.73E-10	3E-08	
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7.20E-01	1.10E-02	1.49E-07	1E-06	1.00E-10	1E-09	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.22E-02	7.00E-01	9.00E-03	1.81E-04	4E-05	9.97E-08	3E-08	4E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	3.58E-03	8.10E-01	8.40E-03	5.32E-05	3E-06	2.73E-08	2E-09	3E-06
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	1.97E-02	1.00E+00	1.60E-02	2.93E-04	2E-04	2.86E-07	2E-07	5E-05
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	3.82E-03	1.00E+00	5.30E-03	5.68E-05	5E-06	1.84E-08	2E-09	5E-06
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6.33E-02		3.74E-03	9.80E-01	5.80E-03	5.57E-05	3E-06	1.97E-08	1E-09	
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	3.14E-03	6.50E-01	2.20E-02	4.67E-05	6E-06	6.28E-08	1E-08	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	6.36E-03	2.00E-01	8.90E-03	9.45E-05	6E-07	5.14E-08	2E-09	8E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				6.17E-03	1.00E+00	1.00E-02	9.18E-05		5.61E-08		
MG/L	METHYLENE CHLORIDE	B2	7.50E-03	7.89E-03	1.65E-03	9.84E-03	9.50E-01	4.50E-03	1.46E-04	1E-06	4.03E-08	3E-10	2E-07
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	2.94E-02	1.00E+00	4.80E-02	4.37E-04	2E-05	1.28E-06	7E-08	9E-07
MG/L	trans-1,2-DICHLOROETHENE					1.07E-02	1.00E+00	1.00E-02	1.59E-04		9.73E-08		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	8.28E-02	1.50E-01	1.60E-02	1.23E-03	1E-05	1.20E-06	9E-08	7E-06
Total Risk													4E-04

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI)

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfD	RfDI	EPC	ABSGI	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	3.56E-01	0.36	3.99E-06	3.99E-06	HQ
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	8.22E-05	0.27	9.21E-10	7.48E-06	
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	2.74E-03	0.039	3.07E-08	6.26E-06	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	1.92E-05	0.0096	2.15E-10	1.07E-05	
MG/L	CADMIUM	B1	3.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	5.48E-05	0.11	3.84E-09	7.67E-04	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	5.48E-04	0.18	3.84E-08	0.0026	
MG/L	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	5.48E-04	0.0091	1.53E-08	3.20E-07	
MG/L	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	5.48E-04	0.015	6.14E-09	5.53E-07	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	2.75E-04		7.70E-11		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	5.48E-02	0.39	6.14E-07	1.10E-04	
MG/L	MERCURY	D			8.57E-05	1.00E-04	1.00E-04	1.00E-03	2.74E-06		1.92E-10		
MG/L	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	2.74E-04	0.014	1.92E-09	3.55E-07	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	4.11E-01		4.60E-06		
MG/L	VANADIUM		7.00E-03	7.00E-05		4.00E-02	1.00E-02	1.60E-04	1.10E-03	0.16	1.23E-08	1.75E-04	
MG/L	DIELDRIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	1.64E-06	0.033	1.84E-09	7.38E-05	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.36E-06		1.00E-05	7.20E-01	1.10E-02	2.74E-07	0.021	2.11E-10	2.25E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		1.22E-02	7.00E-01	9.00E-03	3.34E-04	0.0056	2.10E-07	5.01E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		3.58E-03	8.10E-01	8.40E-03	9.80E-05	0.025	5.76E-08	1.78E-05	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		1.97E-02	1.00E+00	1.60E-02	5.39E-04	0.060	6.04E-07	6.71E-05	
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	3.82E-03	1.00E+00	5.30E-03	1.05E-04	0.0035	3.89E-08	1.30E-06	0.075
MG/L	BROMODICHLOROMETHANE	B2	2.00E-02	1.96E-02		3.74E-03	9.80E-01	5.80E-03	1.03E-04	0.0051	4.16E-08	2.12E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		3.14E-03	6.50E-01	2.20E-02	8.61E-05	0.12	1.33E-07	2.91E-04	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		6.36E-03	2.00E-01	8.90E-03	1.74E-04	0.017	1.09E-07	5.43E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	6.17E-03	1.00E+00	1.00E-02	1.69E-04	0.017	1.18E-07	1.18E-05	0.017
MG/L	METHYLENE CHLORIDE	B2	6.00E-02	5.70E-02	8.57E-01	9.84E-03	9.50E-01	4.50E-03	2.70E-04	0.0045	8.49E-08	1.49E-06	3.15E-04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	2.94E-02	1.00E+00	4.80E-02	8.05E-04	0.080	2.70E-06	2.70E-04	0.0047
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	1.07E-02	1.00E+00	1.00E-02	2.93E-04	0.015	2.05E-07	1.03E-05	0.015
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		8.28E-02	1.50E-01	1.60E-02	2.27E-03	0.38	2.54E-06	0.0028	
Hazard Index										2.3	0.0073	0.11	
Total Hazard Index =										2.5			

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors"
 OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion
 into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the
 USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4.28E-05	--	--	--		4.1E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.19E-04	--	--	--		1.1E-07	
ug/m3	1,1-DICHLOROETHENE	C	4.20E-03	--	--	--		4.0E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.56E-04	--	--	--	1.40E-03	1.5E-07	1.07E-04
ug/m3	BROMODICHLOROMETHANE	B2	1.23E-04	--	--	--		1.2E-07	
ug/m3	CARBON TETRACHLORIDE	B2	4.19E-03	--	--	--		4.0E-06	
ug/m3	CHLOROFORM	B2	6.03E-04	--	--	--	0.00E+00	5.8E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.50E-04	--	--	--	1.00E-02	5.3E-07	5.27E-05
ug/m3	METHYLENE CHLORIDE	B2	3.67E-04	--	--	--	8.57E-01	3.5E-07	4.11E-07
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	2.21E-03	--	--	--	1.71E-01	2.1E-06	1.24E-05
ug/m3	trans-1,2-DICHLOROETHENE		1.27E-03	--	--	--	2.00E-02	1.2E-06	6.09E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.38E-03	--	--	--		1.3E-06	

Total ELCR:

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Total HI:

0.0002

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds.		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (N Plume) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SF0	SF0	SFI	EPC	ABSgl	PC	CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	7.12E-02		5.23E-07		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	1.64E-05	2E-05	1.21E-10	4E-10	2E-04
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	5.48E-04		4.02E-09		
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	3.84E-06		2.82E-11		3E-05
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	1.10E-05		5.03E-10		7E-05
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	1.10E-04		5.03E-09		5E-03
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	1.10E-04		2.01E-09		
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	1.10E-04		8.05E-10		
	Total Risk									1E-04		1E-07	5E-03
											Total Risk =		

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion CDI	HQ	CDI	Dermal HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1 00E-01	1 60E-04	8 31E-01	0 83	6 10E-06	6 10E-05	
MG/L	ARSENIC		3 00E-04	1 23E-04		3 00E-03	4 10E-01	1 60E-04	1 92E-04	0 64	1 41E-09	1 15E-05	
MG/L	BARIUM	A	7 00E-02	4 90E-03		1 00E-01	7 00E-02	1 60E-04	6 39E-03	0 091	4 69E-08	9 58E-06	
MG/L	BERYLLIUM	D	2 00E-03	2 00E-05	1 43E-04	7 00E-04	1 00E-02	1 60E-04	4 47E-05	0 022	3 29E-10	1 64E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06	5 70E-06	2 00E-03	1 00E-02	1 00E-03	1 28E-04	0 26	5 87E-09	0 0012	
MG/L	CHROMIUM, TOTAL	B1	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1 00E-03	1 28E-03	0 43	5 87E-08	0 0039	
MG/L	COBALT	A-D	6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 28E-03	0 021	2 35E-08	4 89E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	1 28E-03	0 035	9 39E-09	8 46E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	6 42E-04		1 18E-10		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	1 28E-01	0 91	9 39E-07	1 68E-04	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1 00E-03	6 39E-06		2 93E-10		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	6 39E-04	0 032	2 93E-09	5 43E-07	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	9 59E-01		7 04E-06		
MG/L	VANADIUM		7 00E-03	7 00E-05		4 00E-02	1 00E-02	1 60E-04	2 56E-03	0 37	1 88E-08	2 68E-04	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	3 84E-06	0 077	2 82E-09	1 13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1 00E-05	7 20E-01	1 10E-02	6 39E-07	0 049	3 23E-10	3 45E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 22E-02	7 00E-01	9 00E-03	7 79E-04	0 013	3 22E-07	7 66E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 58E-03	8 10E-01	8 40E-03	2 29E-04	0 057	8 82E-08	2 72E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		1 97E-02	1 00E+00	1 60E-02	1 26E-03	0 14	9 24E-07	1 03E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	3 82E-03	1 00E+00	5 30E-03	2 44E-04	0 081	5 94E-08	1 98E-06	0 17
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		3 74E-03	9 80E-01	5 80E-03	2 39E-04	0 012	6 37E-08	3 23E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		3 14E-03	6 50E-01	2 20E-02	2 01E-04	0 29	2 03E-07	4 46E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6 36E-03	2 00E-01	8 90E-03	4 06E-04	0 041	1 66E-07	8 30E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	6 17E-03	1 00E+00	1 00E-02	3 95E-04	0 039	1 81E-07	1 81E-05	0 039
MG/L	METHYLENE CHLORIDE	B2	6 00E-02	5 70E-02	8 57E-01	9 84E-03	9 50E-01	4 50E-02	6 29E-04	0 010	1 30E-07	2 28E-06	7 34E-04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 94E-02	1 00E+00	4 80E-02	1 88E-03	0 19	4 14E-06	4 14E-04	0 011
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	1 07E-02	1 00E+00	1 00E-02	6 85E-04	0 034	3 14E-07	1 57E-05	0 034
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		8 28E-02	1 50E-01	1 60E-02	5 29E-03	0 88	3 89E-06	0 0043	
Hazard Index										5.5	0.011	0.3	

Total Hazard Index = 6

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic and carcinogenic compounds:

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$			
				<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air}	Estimated Indoor Air Concentration (ug/m ³)	EPC	b	EPC	b
IR	Inhalation Rate (m ³ /day)	20	a,c	20	a,c
EF	Exposure Frequency (days/year)	250	a	250	a
ED	Exposure Duration (years)	25	a	25	a
CF	Conversion Factor (mg/ug)	1.00E-03		1.00E-03	
BW	Body Weight (kg)	70	a	70	a
AT	Averaging Time (days)	25550	a	25550	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Based on an eight hour workday

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	EPC	CDI	ELCR	RfDi	CDI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	2.0E-01	3.9E-05	2.7E-09	5.5E-10		7.6E-09
ug/m3	1,1,2-TRICHLOROETHANE	C	5.6E-02	1.1E-04	7.8E-09	4.4E-10		2.2E-08
ug/m3	1,1-DICHLOROETHENE	C	1.8E-01	4.0E-03	2.8E-07	4.9E-08		7.8E-07
ug/m3	1,2-DICHLOROETHANE	B2	9.1E-02	1.5E-04	1.0E-08	9.3E-10	1.4E-03	2.9E-08
ug/m3	1,2-DICHLOROPROPANE	B2		3.6E-04	2.5E-08		1.1E-03	7.0E-08
ug/m3	BENZENE	A	2.7E-02	7.7E-04	5.4E-08	1.5E-09	1.7E-03	1.5E-07
ug/m3	CARBON TETRACHLORIDE	B2	5.3E-02	4.0E-03	2.8E-07	1.5E-08		7.9E-07
ug/m3	CHLOROFORM	B2	8.1E-02	5.7E-04	4.0E-08	3.2E-09	0.0E+00	1.1E-07
ug/m3	cis-1,2-DICHLOROETHYLENE	D		5.3E-04	3.7E-08		1.0E-02	1.0E-07
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	2.0E-03	2.1E-03	1.5E-07	3.0E-10	1.7E-01	4.2E-07
ug/m3	trans-1,2-DICHLOROETHENE			1.2E-03	8.6E-08		2.0E-02	2.4E-07
ug/m3	TRICHLOROETHYLENE (TCE)	B2	6.0E-03	1.3E-03	9.2E-08	5.5E-10		2.6E-07
ug/m3	VINYL CHLORIDE	A	1.5E-02	4.9E-03	3.4E-07	5.2E-09	1.1E-01	9.5E-07
			Total ELCR:			7.7E-08	Total HI: 0.0002	

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	250 a
ED =	Exposure Duration (year)	25 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	250 a
ED =	Exposure Duration (year)	25 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^g

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285-6-03, March 25, 1991.
- b = Default factors adapted from EPA Exposure Factors Handbook, August 1997.
- c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- g = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Industrial Worker Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSGI	PC	Ingestion CDI ELCR	Dermal CDI ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	4.54E-02	1.36E-07	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	1.05E-05	3.15E-11	1.2E-10
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	3.49E-04	1.05E-09	
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	2.45E-06	7.34E-12	
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	6.99E-06	1.31E-10	
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	6.99E-05	1.31E-09	
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	6.99E-05	5.24E-10	
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	6.99E-05	2.10E-10	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-08	3.51E-05	2.63E-12	
MG/L	MANGANESE	D				2.00E+00	4.00E-02	1.60E-04	6.99E-03	2.10E-08	
MG/L	MERCURY	D				1.00E-04	1.00E-04	1.00E-03	3.49E-07	6.55E-12	
MG/L	NICKEL	D				1.00E-02	2.70E-01	1.00E-04	3.49E-05	6.55E-11	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	5.24E-02	1.57E-07	
MG/L	VANADIUM					4.00E-02	1.00E-02	1.60E-04	1.40E-04	4.19E-10	
MG/L	DIETHYLENE GLYCOL	B2	1.60E+01	3.20E+01	1.61E+01	6.00E-05	5.00E-01	1.60E-02	2.10E-07	3.4E-06	2.0E-09
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7.20E-01	1.10E-02	3.49E-08	3.2E-07	9.1E-11
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.23E+00	7.00E-01	9.00E-03	7.79E-03	1.3E-03	1.6E-03
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.62E-02	8.10E-01	8.40E-03	9.15E-05	5.2E-06	5.1E-06
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	2.19E-02	1.00E+00	1.60E-02	7.64E-05	4.6E-05	1.3E-05
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	2.23E-02	1.00E+00	5.30E-03	7.68E-05	7.0E-06	7.0E-06
MG/L	1,2-DICHLOROPROPANE	B2	6.80E-02	9.19E-02		2.78E-02	7.40E-01	1.00E-02	9.71E-05	6.6E-06	1.7E-09
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.19E-02	9.70E-01	2.10E-02	7.65E-05	3.01E-08	1.7E-09
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2.21E-02	6.50E-01	2.20E-02	7.73E-05	1.0E-05	4.1E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	2.42E-02	2.00E-01	8.90E-03	8.44E-05	5.1E-07	6.8E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				9.58E-02	1.00E+00	1.00E-02	3.44E-04	6.27E-08	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.82E-02	1.00E+00	4.80E-02	6.37E-05	3.3E-06	3.0E-09
MG/L	trans-1,2-DICHLOROETHYLENE					2.36E-02	1.00E+00	1.00E-02	8.24E-05	1.54E-08	
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	1.83E+00	1.50E-01	1.60E-02	6.41E-03	7.1E-05	3.8E-05
MG/L	VINYL CHLORIDE	A	7.20E-01	7.20E-01	1.54E-02	2.23E-02	1.00E+00	7.30E-03	7.80E-05	5.6E-05	1.2E-06
Total Risk											1.8E-03
Total Risk = 3E-03											3E-03

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD)

704 721

Disposal Area (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfD	RfDd	RfDi	EPC	ABSGI	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	1.27E-01	0.13	3.82E-07	3.82E-06	HQ
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	2.94E-05	0.098	8.81E-11	7.16E-07	
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	9.78E-04	0.014	2.94E-09	5.99E-07	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	6.85E-06	0.0034	2.06E-11	1.03E-06	
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	1.96E-05	0.039	3.67E-10	7.34E-05	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	1.96E-04	0.065	3.67E-09	2.45E-04	
MG/L	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	1.96E-04	0.0033	1.47E-09	3.06E-08	
MG/L	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	1.96E-04	0.0053	5.87E-10	5.29E-08	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	9.82E-05		7.37E-12		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	1.96E-02	0.14	5.87E-08	1.05E-05	
MG/L	MERCURY	D			8.57E-05	1.00E-04	1.00E-04	1.00E-03	9.78E-07		1.83E-11		
MG/L	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	9.78E-05	0.0049	1.83E-10	3.40E-08	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	1.47E-01		4.40E-07		
MG/L	VANADIUM		7.00E-03	7.00E-05		4.00E-02	1.00E-02	1.60E-04	3.91E-04	0.056	1.17E-09	1.68E-05	
MG/L	DIETHYLIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	5.87E-07	0.012	1.76E-10	7.05E-06	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.36E-06		1.00E-05	7.20E-01	1.10E-02	9.78E-08	0.0075	2.02E-11	2.16E-06	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2.23E+00	7.00E-01	9.00E-03	2.18E-02	0.36	3.68E-06	8.76E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.62E-02	8.10E-01	8.40E-03	2.56E-04	0.064	4.04E-08	1.25E-05	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		2.19E-02	1.00E+00	1.60E-02	2.14E-04	0.024	6.42E-08	7.14E-06	
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	2.20E-02	1.00E+00	5.30E-03	2.15E-04	0.0072	2.14E-08	7.12E-07	0.15
MG/L	1,2-DICHLOROPROPANE	B2			1.14E-03	2.78E-02	7.40E-01	1.00E-02	2.72E-04		5.10E-08		0.24
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.19E-02	9.70E-01	2.10E-02	2.14E-04	0.071	8.44E-08	2.90E-05	0.13
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		2.21E-02	6.50E-01	2.20E-02	2.16E-04	0.31	8.93E-08	1.96E-04	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		2.42E-02	2.00E-01	8.90E-03	2.36E-04	0.024	3.94E-08	1.97E-05	
MG/L	dis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	9.58E-02	1.00E+00	1.00E-02	9.36E-04	0.094	1.75E-07	1.75E-05	0.094
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	1.82E-02	1.00E+00	4.80E-02	1.78E-04	0.018	1.61E-07	1.61E-05	0.0010
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	2.36E-02	1.00E+00	1.00E-02	2.31E-04	0.012	4.33E-08	2.16E-06	0.012
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.83E+00	1.50E-01	1.60E-02	1.80E-02	3.0	5.39E-06	0.0060	
MG/L	VINYL CHLORIDE	A	3.00E-03	3.00E-03	1.10E-01	2.23E-02	1.00E+00	7.30E-03	2.19E-04	0.073	2.99E-08	9.97E-06	0.0020
Hazard Index										4.6	0.0067	0.63	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index; * = Inhalation Intake (CDI) = mg

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

Intake for carcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$$

C_{air} =	Estimated Indoor Air Concentration (ug/m ³)
IR =	Inhalation Rate (m ³ /day)
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)
EF =	Exposure Frequency (days/year)
ED =	Exposure Duration (years)
CF =	Conversion Factor (mg/ug)
BW =	Body Weight (kg)
AT =	Averaging Time (days)

Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1.00E-03		1.00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	EPC	CDI	ELCR	RfDI	CDI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	2.03E-05	3.91E-05	6.96E-09	1.41E-09		1.07E-08
ug/m3	1,1,2-TRICHLOROETHANE	C	5.60E-02	1.12E-04	1.99E-08	1.12E-09		3.06E-08
ug/m3	1,1-DICHLOROETHENE	C	1.75E-01	4.01E-03	7.14E-07	1.25E-07		1.10E-06
ug/m3	1,2-DICHLOROETHANE	B2	9.10E-02	1.46E-04	2.60E-08	2.36E-09	1.40E-03	3.99E-08
ug/m3	1,2-DICHLOROPROPANE	B2		3.57E-04	6.37E-08		1.14E-03	9.79E-08
ug/m3	BENZENE	A	2.70E-02	7.73E-04	1.38E-07	3.72E-09	1.70E-03	2.12E-07
ug/m3	CARBON TETRACHLORIDE	B2	5.25E-02	4.03E-03	7.18E-07	3.77E-08		1.10E-06
ug/m3	CHLOROFORM	B2	8.05E-02	5.70E-04	1.01E-07	8.17E-09	0.00E+00	1.56E-07
ug/m3	dis-1,2-DICHLOROETHYLENE	D		5.27E-04	9.38E-08		1.00E-02	1.44E-07
ug/m3	TETRACHLOROETHYLENE(PCl	C-B2	2.00E-03	2.13E-03	3.79E-07	7.59E-10	1.71E-01	5.84E-07
ug/m3	trans-1,2-DICHLOROETHENE			1.22E-03	2.18E-07		2.00E-02	3.35E-07
ug/m3	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	1.32E-03	2.36E-07	1.41E-09		3.63E-07
ug/m3	VINYL CHLORIDE	A	1.54E-02	4.86E-03	8.65E-07	1.33E-08	1.10E-01	1.33E-06
			Total ELCR:			1.95E-07	Total HI:	
							0.0003	

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0 0004 MG/L	COBALT
0 00016 MG/L	COPPER
0 000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Scenario*Dunn Field, Defense Distribution Depot Memphis, Tennessee*

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$	Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic compounds:		
$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a

Inhalation:**CDI = Ingestion CDI from above^f****References:**

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWA} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWA} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSGI	PC	CDI	Ingestion ELCR	Dermal ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	1.93E-01		1.89E-06	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	4.46E-05	7E-05	4.36E-10	2E-09
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	1.49E-03		1.45E-08	
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	1.04E-05		1.02E-10	
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	2.97E-05		1.82E-09	
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	2.97E-04		1.82E-08	
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	2.97E-04		7.27E-09	
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	2.97E-04		2.91E-09	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	1.49E-04		3.65E-11	
MG/L	MANGANESE	D				2.00E+00	4.00E-02	1.60E-04	2.97E-02		2.91E-07	
MG/L	MERCURY	D				1.00E-04	1.00E-04	1.00E-03	1.49E-06		9.09E-11	
MG/L	NICKEL	D				1.00E-02	2.70E-01	1.00E-04	1.49E-04		9.09E-10	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	2.23E-01		2.18E-06	
MG/L	VANADIUM					4.00E-02	1.00E-02	1.60E-04	5.95E-04		5.82E-09	
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	1.61E+01	6.00E-05	5.00E-01	1.60E-02	8.92E-07	1E-05	8.73E-10	3E-08
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7.20E-01	1.10E-02	1.49E-07	1E-06	1.00E-10	1E-09
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.23E+00	7.00E-01	9.00E-03	3.31E-02	7E-03	1.82E-05	7E-03
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.62E-02	8.10E-01	8.40E-03	3.90E-04	2E-05	2.00E-07	1E-08
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	2.19E-02	1.00E+00	1.60E-02	3.25E-04	2E-04	3.18E-07	2E-07
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	2.20E-02	1.00E+00	5.30E-03	3.27E-04	3E-05	1.06E-07	1E-08
MG/L	1,2-DICHLOROPROPANE	B2	6.80E-02	9.19E-02		2.78E-02	7.40E-01	1.00E-02	4.13E-04	3E-05	2.53E-07	2E-08
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.19E-02	9.70E-01	2.10E-02	3.26E-04	2E-05	4.18E-07	2E-08
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2.21E-02	6.50E-01	2.20E-02	3.29E-04	4E-05	4.42E-07	9E-08
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	2.42E-02	2.00E-01	8.90E-03	3.59E-04	2E-06	1.95E-07	6E-09
MG/L	cis-1,2-DICHLOROETHYLENE	D				9.56E-02	1.00E+00	1.00E-02	1.42E-03		8.69E-07	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.82E-02	1.00E+00	4.80E-02	2.71E-04	1E-05	7.96E-07	4E-08
MG/L	trans-1,2-DICHLOROETHENE					2.36E-02	1.00E+00	1.00E-02	3.51E-04		2.14E-07	
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	1.83E+00	1.50E-01	1.60E-02	2.73E-02	3E-04	2.67E-05	2E-04
MG/L	VINYL CHLORIDE	A	7.20E-01	7.20E-01	1.54E-02	2.23E-02	1.00E+00	7.30E-03	3.32E-04	2E-04	1.48E-07	5E-06
MG/L	Total Risk									8E-03	8E-06	7E-03

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD)

704 727

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion CDI	HQ	Dermal CDI	HQ	Inhalation* HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	3.66E-01	0.36	3.99E-06	3.99E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	8.22E-05	0.27	9.21E-10	7.48E-06	
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	2.74E-03	0.039	3.07E-08	6.26E-06	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	1.92E-05	0.0096	2.15E-10	1.07E-05	
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	5.48E-05	0.11	3.84E-09	7.67E-04	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	5.48E-04	0.18	3.84E-08	0.0026	
MG/L	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	5.48E-04	0.0091	1.53E-08	3.20E-07	
MG/L	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	5.48E-04	0.015	6.14E-09	5.53E-07	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	2.75E-04		7.70E-11		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	5.48E-02	0.39	6.14E-07	1.10E-04	
MG/L	MERCURY	D			8.57E-05	1.00E-04	1.00E-04	1.00E-03	2.74E-06		1.92E-10		
MG/L	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	2.74E-04	0.014	1.92E-09	3.55E-07	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	4.11E-01		4.60E-06		
MG/L	VANADIUM		7.00E-03	7.00E-05		4.00E-02	1.00E-02	1.60E-04	1.10E-03	0.16	1.23E-08	1.75E-04	
MG/L	DIELDRIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	1.64E-06	0.033	1.84E-09	7.36E-05	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.38E-06		1.00E-05	7.20E-01	1.10E-02	2.74E-07	0.021	2.11E-10	2.25E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2.23E+00	7.00E-01	9.00E-03	6.10E-02	1.0	3.85E-05	9.16E-04	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.62E-02	8.10E-01	8.40E-03	7.18E-04	0.18	4.22E-07	1.30E-04	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		2.19E-02	1.00E+00	1.60E-02	5.99E-04	0.067	6.71E-07	7.46E-05	0.43
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	2.20E-02	1.00E+00	5.30E-03	6.02E-04	0.020	2.23E-07	7.44E-06	0.67
MG/L	1,2-DICHLOROPROPANE	B2			1.14E-03	2.78E-02	7.40E-01	1.00E-02	7.61E-04		5.33E-07		0.35
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.19E-02	9.70E-01	2.10E-02	6.00E-04	0.20	8.82E-07	3.03E-04	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		2.21E-02	6.50E-01	2.20E-02	6.06E-04	0.87	9.33E-07	0.0021	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		2.42E-02	2.00E-01	8.90E-03	6.82E-04	0.066	4.12E-07	2.06E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	9.56E-02	1.00E+00	1.00E-02	2.62E-03	0.26	1.83E-06	1.83E-04	0.26
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	1.82E-02	1.00E+00	4.80E-02	5.00E-04	0.050	1.68E-06	1.68E-04	0.0029
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	2.36E-02	1.00E+00	1.00E-02	6.46E-04	0.032	4.52E-07	2.26E-05	0.032
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.83E+00	1.50E-01	1.60E-02	5.03E-02	8.4	5.63E-05	0.063	
MG/L	VINYL CHLORIDE	A	3.00E-03	3.00E-03	1.10E-01	2.23E-02	1.00E+00	7.30E-03	6.12E-04	0.20	3.13E-07	1.04E-04	0.0056
Hazard Index													13
Total Hazard Index =													15

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = if

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	--	--	--		3.75E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	--	--	--		1.07E-07	
ug/m3	1,1-DICHLOROETHENE	C	--	--	--		3.85E-06	
ug/m3	1,2-DICHLOROETHANE	B2	--	--	--	1.40E-03	1.40E-07	9.99E-05
ug/m3	1,2-DICHLOROPROPANE	B2	--	--	--	1.14E-03	3.43E-07	3.01E-04
ug/m3	BENZENE	A	--	--	--	1.70E-03	7.42E-07	4.36E-04
ug/m3	CARBON TETRACHLORIDE	B2	--	--	--		3.87E-06	
ug/m3	CHLOROFORM	B2	--	--	--	0.00E+00	5.46E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	--	--	--	1.00E-02	5.05E-07	5.05E-05
ug/m3	TETRACHLOROETHYLENE (PCE)	C-B2	--	--	--	1.71E-01	2.04E-06	1.19E-05
ug/m3	trans-1,2-DICHLOROETHENE		--	--	--	2.00E-02	1.17E-06	5.87E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	--	--	--		1.27E-06	
ug/m3	VINYL CHLORIDE	A	--	--	--	1.10E-01	4.66E-06	4.24E-05
Total ELCR:			--	--	--	Total HI: 0.0010		

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0 0004 MG/L	COBALT
0 00016 MG/L	COPPER
0 000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b, e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (NW Plume) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSGI	PC	CDI	Ingestion ELCR	CDI	Dermal ELCR	Inhalation ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	7.12E-02		5.23E-07		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	1.64E-05	2E-05	1.21E-10	4E-10	2E-04
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	5.48E-04		4.02E-09		
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	3.84E-06		2.82E-11		3E-05
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	1.10E-05		5.03E-10		7E-05
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	1.10E-04		5.03E-09		5E-03
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	1.10E-04		2.01E-09		
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	1.10E-04		8.05E-10		
	Total Risk									3E-03		2E-06	8E-03
										Total Risk =		1E-02	

704 733

Disposal Area (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSGI	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	8.31E-01	0.83	6.10E-06	6.10E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	1.92E-04	0.64	1.41E-09	1.15E-05	
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	6.39E-03	0.091	4.69E-08	9.58E-06	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	4.47E-05	0.022	3.29E-10	1.64E-05	
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	1.28E-04	0.26	5.87E-09	0.0012	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	1.28E-03	0.43	5.87E-08	0.0039	
MG/L	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	1.28E-03	0.021	2.35E-08	4.89E-07	
MG/L	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	1.28E-03	0.035	9.39E-09	8.46E-07	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	6.42E-04		1.18E-10		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	1.28E-01	0.91	9.39E-07	1.68E-04	
MG/L	MERCURY	D			8.57E-05	1.00E-04	1.00E-04	1.00E-03	6.39E-06		2.93E-10		
MG/L	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	6.39E-04	0.032	2.93E-09	5.43E-07	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	9.59E-01		7.04E-06		
MG/L	Vanadium		7.00E-03	7.00E-05		4.00E-02	1.00E-02	1.60E-04	2.56E-03	0.37	1.88E-08	2.68E-04	
MG/L	DIETHYLIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	3.84E-06	0.077	2.82E-09	1.13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.36E-06		1.00E-05	7.20E-01	1.10E-02	6.39E-07	0.049	3.23E-10	3.45E-05	
MG/L	1,1,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2.23E+00	7.00E-01	9.00E-03	1.42E-01	2.4	5.88E-05	0.0014	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.62E-02	8.10E-01	8.40E-03	1.67E-03	0.42	6.46E-07	1.99E-04	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		2.19E-02	1.00E+00	1.60E-02	1.40E-03	0.16	1.03E-06	1.14E-04	1.0
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	2.20E-02	1.00E+00	5.30E-03	1.40E-03	0.047	3.42E-07	1.14E-05	1.6
MG/L	1,2-DICHLOROPROPANE	B2			1.14E-03	2.78E-02	7.40E-01	1.00E-02	1.78E-03		8.15E-07		0.82
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.19E-02	9.70E-01	2.10E-02	1.40E-03	0.47	1.35E-06	4.64E-04	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		2.21E-02	6.50E-01	2.20E-02	1.41E-03	2.0	1.43E-06	0.0031	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		2.42E-02	2.00E-01	8.90E-03	1.54E-03	0.15	6.31E-07	3.15E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	9.56E-02	1.00E+00	1.00E-02	6.11E-03	0.61	2.81E-06	2.81E-04	0.61
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	1.82E-02	1.00E+00	4.80E-02	1.17E-03	0.12	2.57E-06	2.57E-04	0.0068
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	2.36E-02	1.00E+00	1.00E-02	1.51E-03	0.075	6.92E-07	3.46E-05	0.075
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.83E+00	1.50E-01	1.60E-02	1.17E-01	20	8.61E-05	0.096	
MG/L	VINYL CHLORIDE	A	3.00E-03	3.00E-03	1.10E-01	2.23E-02	1.00E+00	7.30E-03	1.43E-03	0.48	4.78E-07	1.59E-04	0.013
Hazard Index										30	0.11	4.1	

Total Hazard Index = 34

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic and carcinogenic compounds:

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$			
		<u>Carcinogenic</u>		<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	EPC	b	EPC	b
IR =	Inhalation Rate (m ³ /day)	20	a,c	20	a,c
EF =	Exposure Frequency (days/year)	250	a	250	a
ED =	Exposure Duration (years)	25	a	25	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	25550	a

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Based on an eight hour workday

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.4E-05	2.0E-01	2.4E-09	4.8E-10		6.6E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.4E-05	5.6E-02	6.6E-09	3.7E-10		1.8E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9.1E-05		6.3E-09			1.8E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.3E-03	5.3E-02	2.3E-07	1.2E-08		6.5E-07	
ug/m3	CHLOROFORM	B2	4.9E-04	8.1E-02	3.4E-08	2.7E-09	0.0E+00	9.6E-08	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.3E-04		3.0E-08		1.0E-02	8.5E-08	8.45E-06
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	1.7E-03	2.0E-03	1.2E-07	2.4E-10	1.7E-01	3.4E-07	1.98E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.9E-04		6.9E-08		2.0E-02	1.9E-07	9.72E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	6.0E-03	7.6E-08	4.6E-10		2.1E-07	

Total ELCR: 1.6E-08

Total HI: 0.00002

704 737

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0.0004 MG/L	COBALT
0.00016 MG/L	COPPER
0.000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds.		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	250 a
ED =	Exposure Duration (year)	25 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a

Dermal:

Intake for non-carcinogenic and carcinogenic compounds

CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	250 a
ED =	Exposure Duration (year)	25 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a

Inhalation.

CDI = Ingestion CDI from above^a

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = Default factors adapted from EPA Exposure Factors Handbook, August 1997
- c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- g = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 739

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSGI	PC	CDI	Ingestion ELCR	Dermal CDI	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	4.54E-02		1.36E-07	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	1.05E-05	1.6E-05	3.15E-11	1.2E-10
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	3.49E-04		1.05E-09	
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	2.45E-06		7.34E-12	
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	6.99E-06		1.31E-10	
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	6.99E-05		1.31E-09	
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	6.99E-05		5.24E-10	
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	6.99E-05		2.10E-10	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	3.51E-05		2.63E-12	
MG/L	MANGANESE	D				2.00E+00	4.00E-02	1.60E-04	6.99E-03		2.10E-08	
MG/L	MERCURY	D				1.00E-04	1.00E-04	1.00E-03	3.49E-07		6.55E-12	
MG/L	NICKEL	D				1.00E-02	2.70E-01	1.00E-04	3.49E-05		6.55E-11	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	5.24E-02		1.57E-07	
MG/L	VANADIUM					4.00E-02	1.00E-02	1.60E-04	1.40E-04		4.19E-10	
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	1.61E+01	6.00E-05	5.00E-01	1.60E-02	2.10E-07	3.4E-06	6.29E-11	2.0E-09
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7.20E-01	1.10E-02	3.49E-08	3.2E-07	7.21E-12	9.1E-11
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.21E-01	7.00E-01	9.00E-03	4.22E-04	8.4E-05	7.12E-08	2.0E-08
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	5.05E-03	8.10E-01	8.40E-03	1.77E-05	1.0E-06	2.78E-09	2.0E-10
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6.33E-02		4.15E-03	9.80E-01	5.80E-03	1.45E-05	9.0E-07	1.58E-09	1.0E-10
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	3.14E-02	6.50E-01	2.20E-02	1.10E-04	1.4E-05	4.53E-08	5.8E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	3.19E-01	2.00E-01	8.90E-03	1.11E-03	6.8E-06	1.86E-07	5.7E-09
MG/L	cis-1,2-DICHLOROETHYLENE	D				7.64E-03	1.00E+00	1.00E-02	2.67E-05		5.01E-09	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	5.66E-03	1.00E+00	4.80E-02	1.98E-05	1.0E-06	1.78E-08	4.0E-08
MG/L	trans-1,2-DICHLOROETHENE					4.34E-03	1.00E+00	1.00E-02	1.52E-05		2.84E-09	
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	1.45E-01	1.50E-01	1.60E-02	5.05E-04	5.6E-06	1.52E-07	3.0E-06
MG/L	Total Risk									1.3E-04	5.0E-08	1.9E-04

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RFDo	RFDd	RfDi	EPC	ABSgl	PC	Ingestion CDI	HQ	Dermal CDI	HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1 00E-01	1 60E-04	1 27E-01	0 13	3 82E-07	3 82E-06	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 00E-03	4 10E-01	1 60E-04	2 94E-05	0 098	8 81E-11	7 16E-07	
MG/L	BARIUM	D	7 00E-02	4 90E-03		1 43E-04	1 00E-01	7 00E-02	9 78E-04	0 014	2 94E-09	5 99E-07	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05		5 70E-05	1 00E-02	1 60E-04	6 85E-06	0 0034	2 06E-11	1 03E-06	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	1 96E-05	0 039	3 67E-10	7 34E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05		2 86E-05	2 00E-02	5 00E-03	1 00E-04	0 065	3 67E-09	2 45E-04	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 96E-04	0 0033	1 47E-09	3 06E-08	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	1 96E-04	0 0053	5 87E-10	5 29E-08	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	9 82E-05		7 37E-12		
MG/L	MANGANESE	D	1 40E-01	5 60E-03		1 43E-05	2 00E+00	4 00E-02	1 60E-04	0 14	5 87E-08	1 05E-05	
MG/L	MERCURY	D				8 57E-05	1 00E-04	1 00E-04	9 78E-07		1 83E-11		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	9 78E-05	0 0049	1 83E-10	3 40E-08	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	1 47E-01		4 40E-07		
MG/L	VANADIUM		7 00E-03	7 00E-05		4 00E-02	1 00E-02	1 60E-04	3 91E-04	0 056	1 17E-09	1 68E-05	
MG/L	DIETHYLENE GLYCOL	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	5 87E-07	0 012	1 76E-10	7 03E-06	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1 00E-05	7 20E-01	1 10E-02	9 78E-08	0 0075	2 02E-11	2 18E-06	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 21E-01	7 00E-01	9 00E-03	1 18E-03	0 020	1 99E-07	4 75E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		5 05E-03	8 10E-01	8 40E-03	4 95E-05	0 012	7 79E-09	2 40E-06	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		4 15E-03	9 80E-01	5 80E-03	4 06E-05	0 0020	4 42E-09	2 25E-07	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		3 14E-02	6 50E-01	2 20E-02	3 07E-04	0 44	1 27E-07	2 79E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		3 19E-01	2 00E-01	8 90E-03	3 12E-03	0 31	5 21E-07	2 60E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02		7 64E-03	1 00E+00	1 00E-02	7 48E-05	0 0075	1 40E-08	1 40E-06	0 0075
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02		1 71E-01	5 68E-03	1 00E+00	4 80E-02	0 0055	4 98E-08	4 98E-06	3 24E-04
MG/L	trans-1,2-DICHLOROETHYLENE		2 00E-02	2 00E-02		2 00E-02	1 00E+00	1 00E-02	4 25E-05	0 0021	7 96E-09	3 98E-07	0 0021
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 45E-01	1 50E-01	1 60E-02	1 41E-03	0 24	4 24E-07	4 71E-04	
Hazard Index													0.0014
													0.0099

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = int

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$		$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$	
				Carcinogenic	Noncarcinogenic
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)			EPC	b
IR =	Inhalation Rate (m ³ /day)			NA	20
IRadj =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)			13	a,c
EF =	Exposure Frequency (days/year)			350	a
ED =	Exposure Duration (years)			NA	30
CF =	Conversion Factor (mg/ug)			1.00E-03	1.00E-03
BW =	Body Weight (kg)			NA	70
AT =	Averaging Time (days)			25550	10950

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	2.03E-05	6.04E-09	1.23E-09		9.29E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	5.60E-02	1.68E-08	9.40E-10		2.58E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9.07E-05	1.62E-08			2.48E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.31E-03	5.89E-07	3.09E-08		9.06E-07	
ug/m3	CHLOROFORM	B2	4.88E-04	8.70E-08	7.00E-09	0.00E+00	1.34E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.32E-04	7.69E-08		1.00E-02	1.18E-07	1.18E-05
ug/m3	TETRACHLOROETHYLENE(PCl	C-B2	1.73E-03	3.08E-07	6.16E-10	1.71E-01	4.74E-07	2.77E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.93E-04	1.77E-07		2.00E-02	2.72E-07	1.36E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	1.94E-07	1.16E-09		2.98E-07	

Total ELCR: 4.19E-08

Total HI: 0.00003

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$	Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation:

$CDI =$ Ingestion CDI from above ^f

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"
 OSWER Directive 9285.6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{Bwa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

$$1.09 \text{ (L-year)/(kg-day)}$$

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{Bwa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

$$9480 \text{ (cm}^2\text{-year)/(kg)}$$

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion CDI ELCR	Dermal CDI ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	1.93E-01	1.89E-06	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	4.46E-05	4.36E-10	2E-09
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	1.49E-03	1.45E-08	
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	1.04E-05	1.02E-10	
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	2.97E-05	1.82E-09	
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	2.97E-04	1.82E-08	
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	2.97E-04	7.27E-09	
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	2.97E-04	2.91E-09	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	1.49E-04	3.65E-11	
MG/L	MANGANESE	D				2.00E+00	4.00E-02	1.60E-04	2.97E-02	2.91E-07	
MG/L	MERCURY	D				1.00E-04	1.00E-04	1.00E-03	1.49E-06	9.09E-11	
MG/L	NICKEL	D				1.00E-02	2.70E-01	1.00E-04	1.49E-04	9.09E-10	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	2.23E-01	2.18E-06	
MG/L	VANADIUM					4.00E-02	1.00E-02	1.60E-04	5.95E-04	5.82E-09	
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	1.61E+01	6.00E-05	5.00E-01	1.60E-02	8.92E-07	8.73E-10	3E-08
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7.20E-01	1.10E-02	1.49E-07	1.00E-10	1E-09
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.21E-01	7.00E-01	9.00E-03	1.79E-03	9.87E-07	4E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	5.05E-03	8.10E-01	8.40E-03	7.52E-05	3.86E-08	4E-06
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6.33E-02		4.15E-03	9.80E-01	5.80E-03	6.17E-05	2.19E-08	1E-09
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	3.14E-02	6.50E-01	2.20E-02	4.67E-04	6.28E-07	2E-05
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	3.19E-01	2.00E-01	8.90E-03	4.74E-03	2.58E-06	4E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				7.64E-03	1.00E+00	1.00E-02	1.14E-04	6.95E-08	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	5.66E-03	1.00E+00	4.80E-02	8.42E-05	2.47E-07	2E-07
MG/L	trans-1,2-DICHLOROETHENE					4.34E-03	1.00E+00	1.00E-02	6.46E-05	3.95E-08	
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	1.45E-01	1.50E-01	1.60E-02	2.15E-03	2E-05	1E-05
Total Risk											6E-04

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD)

704 745

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MGL	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	3.56E-01	0.36	3.99E-06	3.99E-05	HQ
MGL	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	8.22E-05	0.27	9.21E-10	7.48E-06	
MGL	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	2.74E-03	0.039	3.07E-08	6.26E-06	
MGL	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	1.92E-05	0.0096	2.15E-10	1.07E-05	
MGL	CADMIUM	B1	5.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	5.48E-05	0.11	3.84E-09	7.67E-04	
MGL	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	5.48E-04	0.18	3.84E-08	0.0026	
MGL	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	5.48E-04	0.0091	1.53E-08	3.20E-07	
MGL	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	5.48E-04	0.015	6.14E-09	5.53E-07	
MGL	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	2.75E-04		7.70E-11		
MGL	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	5.48E-02	0.39	6.14E-07	1.10E-04	
MGL	MERCURY	D			8.57E-05	1.00E-04	1.00E-04	1.00E-03	2.74E-06		1.92E-10		
MGL	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	2.74E-04	0.014	1.92E-09	3.55E-07	
MGL	SILICON					1.50E+01	2.00E-01	1.60E-04	4.11E-01		4.60E-06		
MGL	VANADIUM					4.00E-02	1.00E-02	1.60E-04	1.10E-03	0.16	1.23E-08	1.75E-04	
MGL	DIELDRIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	1.64E-06	0.033	1.84E-09	7.36E-05	
MGL	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.36E-06		1.00E-05	7.20E-01	1.10E-02	2.74E-07	0.021	2.11E-10	2.25E-05	
MGL	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		1.21E-01	7.00E-01	9.00E-03	3.31E-03	0.055	2.08E-06	4.96E-05	
MGL	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		5.05E-03	8.10E-01	8.40E-03	1.38E-04	0.035	8.14E-08	2.51E-05	
MGL	BROMODICHLOROMETHANE	B2	2.00E-02	1.96E-02		4.15E-03	9.80E-01	5.80E-03	1.14E-04	0.0057	4.62E-08	2.36E-06	
MGL	CARBON TETRACHLORIDE	B2	7.00E-04	4.59E-04		3.14E-02	6.50E-01	2.20E-02	8.60E-04	1.2	1.32E-06	0.0029	
MGL	CHLOROFORM	B2	1.00E-02	2.00E-03		3.19E-01	2.00E-01	8.90E-03	8.74E-03	0.87	5.44E-06	0.0027	
MGL	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	7.64E-03	1.00E+00	1.00E-02	2.09E-04	0.021	1.47E-07	1.47E-05	0.021
MGL	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	5.66E-03	1.00E+00	4.80E-02	1.55E-04	0.016	5.21E-07	5.21E-05	9.07E-04
MGL	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	4.34E-03	1.00E+00	1.00E-02	1.19E-04	0.0059	8.32E-08	4.16E-06	0.0059
MGL	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.45E-01	1.50E-01	1.60E-02	3.96E-03	0.66	4.43E-06	0.0049	
Hazard Index										4.5	0.014	0.028	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds.

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	
		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC
IR =	Inhalation Rate (m ³ /day)	NA	15
EF =	Exposure Frequency (days/year)	NA	350
ED =	Exposure Duration (years)	NA	6
CF =	Conversion Factor (mg/ug)	NA	1.00E-03
BW =	Body Weight (kg)	NA	15
AT =	Averaging Time (days)	NA	2190

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.39E-05	--	--	--		3.3E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.42E-05	--	--	--		9.0E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9.07E-05	--	--	--		8.7E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.31E-03	--	--	--		3.2E-06	
ug/m3	CHLOROFORM	B2	4.88E-04	--	--	--	0.00E+00	4.7E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.32E-04	--	--	--	1.00E-02	4.1E-07	4.14E-05
ug/m3	TETRACHLOROETHYLENE(PCl	C-B2	1.73E-03	--	--	--	1.71E-01	1.7E-06	9.70E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.93E-04	--	--	--	2.00E-02	9.5E-07	4.76E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	--	--	--		1.0E-06	

Total ELCR: -- Total HI: 0.0001

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 749

Disposal Area (Potable Use) (SW Plume) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1.60E-04	7.12E-02	5.23E-07				
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.00E-03	4.10E-01	1.60E-04	1.64E-05	2E-05	1.21E-10	4E-10	2E-04	
MG/L	BARIUM	D				1.00E-01	7.00E-02	1.60E-04	5.48E-04		4.02E-09			
MG/L	BERYLLIUM	B1			8.40E+00	7.00E-04	1.00E-02	1.60E-04	3.84E-06		2.82E-11		3E-05	
MG/L	CADMIUM	B1			6.30E+00	2.00E-03	1.00E-02	1.00E-03	1.10E-05		5.03E-10		7E-05	
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2.00E-02	5.00E-03	1.00E-03	1.10E-04		5.03E-09		5E-03	
MG/L	COBALT					2.00E-02	8.00E-01	4.00E-04	1.10E-04		2.01E-09			
MG/L	COPPER	D				2.00E-02	3.00E-01	1.60E-04	1.10E-04		8.05E-10			
	Total Risk									2E-04		2E-07	5E-03	
											Total Risk =			

Disposal Area (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	Inhalation*
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.30E+01	1.00E-01	1.60E-04	8.31E-01	0.83	6.10E-06	6.10E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4.10E-01	1.60E-04	1.92E-04	0.64	1.41E-09	1.15E-05	
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.00E-01	7.00E-02	1.60E-04	6.39E-03	0.091	4.69E-08	9.58E-06	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5.70E-06	7.00E-04	1.00E-02	1.60E-04	4.47E-05	0.022	3.29E-10	1.64E-05	
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.00E-03	1.00E-02	1.00E-03	1.28E-04	0.26	5.87E-09	0.0012	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.00E-02	5.00E-03	1.00E-03	1.28E-03	0.43	5.87E-08	0.0039	
MG/L	COBALT		6.00E-02	4.80E-02		2.00E-02	8.00E-01	4.00E-04	1.28E-03	0.021	2.35E-08	4.89E-07	
MG/L	COPPER	D	3.70E-02	1.11E-02		2.00E-02	3.00E-01	1.60E-04	1.28E-03	0.035	9.39E-09	8.46E-07	
MG/L	LEAD	B2				1.00E-02	1.50E-01	4.00E-06	6.42E-04		1.18E-10		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	2.00E+00	4.00E-02	1.60E-04	1.28E-01	0.91	9.39E-07	1.68E-04	
MG/L	MERCURY	D			8.57E-05		1.00E-04	1.00E-04	1.00E-03		2.93E-10		
MG/L	NICKEL	D	2.00E-02	5.40E-03		1.00E-02	2.70E-01	1.00E-04	6.39E-06	0.032	2.93E-09	5.43E-07	
MG/L	SILICON					1.50E+01	2.00E-01	1.60E-04	9.59E-01		7.04E-06		
MG/L	VANADIUM		7.00E-03	7.00E-05		4.00E-02	1.00E-02	1.60E-04	2.56E-03	0.37	1.88E-08	2.68E-04	
MG/L	DIELDRIN	B2	5.00E-05	2.50E-05		6.00E-05	5.00E-01	1.60E-02	3.84E-06	0.077	2.82E-09	1.13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9.36E-06		1.00E-05	7.20E-01	1.05E-02	6.39E-07	0.049	3.23E-10	3.45E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		1.21E-01	7.00E-01	9.00E-03	7.72E-03	0.13	3.19E-06	7.59E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		5.05E-03	8.10E-01	8.40E-03	3.23E-04	0.081	1.25E-07	3.84E-05	
MG/L	BROMODICHLOROMETHANE	B2	2.00E-02	1.96E-02		4.15E-03	9.80E-01	5.80E-03	2.65E-04	0.013	7.07E-08	3.60E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		3.14E-02	6.50E-01	2.20E-02	2.01E-03	2.9	2.03E-06	0.0045	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		3.19E-01	2.00E-01	8.90E-03	2.04E-02	2.0	8.33E-06	0.0042	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	7.64E-03	1.00E+00	1.00E-02	4.89E-04	0.049	2.24E-07	2.24E-05	0.049
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	5.66E-03	1.00E+00	4.80E-02	3.62E-04	0.036	7.97E-07	7.97E-05	0.0021
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2.00E-02	4.34E-03	1.00E+00	1.00E-02	2.77E-04	0.014	1.27E-07	6.37E-06	0.014
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.45E-01	1.50E-01	1.60E-02	9.24E-03	1.5	6.78E-06	0.0075	
Hazard Index											11	0.022	0.065

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds.		
CDI =	Age-specific intake (for carcinogenic compounds only)	
$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds		
CDI =	Age-specific intake (for carcinogenic compounds only):	
$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation

CDI = Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 752

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SfO	SfD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.27E+01	1.00E-01	1.60E-04	1.89E-01					
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	2.23E-03	4.10E-01	1.60E-04	3.32E-05	5E-05	3.25E-10	1E-09		
MG/L	BARIUM	D				1.60E-01	7.00E-02	1.60E-04	2.38E-03		2.32E-08			
MG/L	CHROMIUM, TOTAL	A-D				2.08E-02	5.00E-03	1.00E-03	3.09E-04		1.89E-08			
MG/L	LEAD	B2				3.95E-03	1.50E-01	4.00E-06	5.87E-05		1.44E-11			
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	1.40E-02	7.37E-02	1.40E-02	6.00E-03	1.90E-01	1.60E-04	8.92E-05	1E-06	8.73E-10	6E-11		
Total Risk										5E-05			1E-09	5E-05

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.27E+01	1.00E-01	1.60E-04	3.48E-01	0.3	3.89E-06	3.89E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		2.23E-03	4.10E-01	1.60E-04	6.11E-05	0.20	6.85E-10	5.57E-06	
MG/L	BARIIUM	D	7.00E-02	4.90E-03		1.60E-01	7.00E-02	1.60E-04	4.38E-03	0.063	4.90E-08	1.00E-05	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.08E-02	5.00E-03	1.00E-03	5.69E-04	0.2	3.98E-08	0.003	
MG/L	LEAD	B2				3.95E-03	1.50E-01	4.00E-06	1.08E-04		3.03E-11		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2.00E-02	3.80E-03		6.00E-03	1.90E-01	1.60E-04	1.64E-04	0.008	1.84E-09	4.84E-07	
	Hazard Index									0.8		0.003	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Total Hazard Index = 0.8

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997
- Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW30) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.27E+01	1.00E-01	1.60E-04	6.95E-02				5.11E-07	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	2.23E-03	4.10E-01	1.60E-04	1.22E-05	2E-05	8.98E-11	3E-10	2E-04	
MG/L	BARIUM	D				1.60E-01	7.00E-02	1.60E-04	8.76E-04				6.43E-09	
MG/L	CHROMIUM, TOTAL	A-D				2.08E-02	5.00E-03	1.00E-03	1.14E-04				5.22E-09	
MG/L	LEAD	B2				3.95E-03	1.50E-01	4.00E-06	2.16E-05				3.97E-12	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	1.40E-02	7.37E-02	1.40E-02	6.00E-03	1.90E-01	1.60E-04	3.29E-05	5E-07	2.41E-10	2E-11	5E-07	
Total Risk										2E-05	Total Risk =		3E-10	2E-04
													2E-04	

704 753

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDI	EPC	ABSgl	PC	CDI	Ingestion	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.27E+01	1.00E-01	1.60E-04	8.11E-01	0.8	5.96E-06	5.96E-05		5.96E-06	5.96E-05		
MG/L	ARSENIC	A	3.00E-04	1.23E-04		2.23E-03	4.10E-01	1.60E-04	1.43E-04	0.5	1.05E-09	8.52E-06		1.05E-09	8.52E-06		
MG/L	BARIUM	D	7.00E-02	4.90E-03		1.43E-04	1.60E-01	1.60E-04	1.02E-02	0.15	7.50E-08	1.53E-05		7.50E-08	1.53E-05		
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05		2.86E-05	5.00E-03	1.00E-03	1.33E-03	0.4	6.09E-08	0.004		6.09E-08	0.004		
MG/L	LEAD	B2				3.95E-03	1.50E-01	4.00E-06	2.52E-04		4.64E-11			4.64E-11			
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2.00E-02	3.80E-03		6.00E-03	1.90E-01	1.60E-04	3.84E-04	0.019	2.82E-09	7.41E-07		2.82E-09	7.41E-07		
Hazard Index																	
										Total Hazard Index =		1.9					
										Total Hazard Index =		1.9					

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

CDI=	$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$			
		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	EPC	b	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1.00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.4E-05	2.0E-01	6.0E-09	1.2E-09		9.3E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.4E-05	5.6E-02	1.7E-08	9.4E-10		2.6E-08	
ug/m3	1,1-DICHLOROETHENE	C	3.3E-03	1.8E-01	6.0E-07	1.0E-07		9.2E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.2E-04	9.1E-02	2.2E-08	2.0E-09	1.4E-03	3.4E-08	2.45E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.3E-03	5.3E-02	5.9E-07	3.1E-08		9.1E-07	
ug/m3	CHLOROFORM	B2	4.8E-04	8.1E-02	8.6E-08	6.9E-09	0.0E+00	1.3E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.3E-04		7.7E-08		1.0E-02	1.2E-07	1.19E-05
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	1.7E-03	2.0E-03	3.1E-07	6.2E-10	1.7E-01	4.8E-07	2.80E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.0E-03		1.8E-07		2.0E-02	2.7E-07	1.37E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	6.0E-03	1.9E-07	1.2E-09		3.0E-07	

Total ELCR: 1.48E-07

Total HI: 0.0001

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only)	
	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
IR = Ingestion Rate (L/day)	N/A	2 a
IR_{adj} = Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a
Dermal:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only)	
	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
SA = Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} = Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC = Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET = Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
CF = Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a

Inhalation:

$CDI =$ Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"

OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 760

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSGI	PC	CDI	Ingestion ELCR	Dermal CDI	ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.36E+01	1.00E-01	1.60E-04	2.02E-01		1.97E-06		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.26E-03	4.10E-01	1.60E-04	4.85E-05	7E-05	4.74E-10	2E-09	
MG/L	BARIUM	D				1.79E-01	7.00E-02	1.60E-04	2.66E-03		2.60E-08		
MG/L	CHROMIUM, TOTAL	A-D				2.89E-02	5.00E-03	1.00E-03	4.30E-04		2.63E-08		
MG/L	IRON					4.30E+00	1.50E-01	1.60E-04	6.39E-02		6.25E-07		
MG/L	LEAD	B2				1.09E-02	1.50E-01	4.00E-06	1.63E-04		3.98E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	4.77E-02	7.00E-01	9.00E-03	7.09E-04	1E-04	3.90E-07	1E-07	1E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	3.78E-03	8.10E-01	8.40E-03	5.63E-05	3E-06	2.89E-08	2E-09	3E-06
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	2.22E-02	1.00E+00	1.60E-02	3.30E-04	2E-04	3.23E-07	2E-07	6E-05
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	5.88E-03	1.00E+00	5.30E-03	8.45E-05	8E-06	2.74E-08	2E-09	8E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2.88E-03	6.50E-01	2.20E-02	4.28E-05	6E-06	5.76E-08	1E-08	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	1.18E-02	2.00E-01	8.90E-03	1.76E-04	1E-06	9.59E-08	3E-09	1E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				1.40E-02	1.00E+00	1.00E-02	2.08E-04		1.27E-07		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	3.31E-02	1.00E+00	4.80E-02	4.92E-04	3E-05	1.44E-06	8E-08	1E-06
MG/L	trans-1,2-DICHLOROETHENE					2.35E-02	1.00E+00	1.00E-02	3.50E-04		2.14E-07		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.62E-01	1.50E-01	1.60E-02	3.89E-03	4E-05	3.81E-06	3E-07	2E-05
Total Risk										5E-04	7E-07	8E-04	3E-04

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RFDo	RFd	RFdi	EPC	ABSgl	PC	Ingestion CDI	HQ	Dermal CDI	HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 38E+01	1 00E-01	1 60E-04	3 72E-01	0 4	4 16E-06	4 16E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 26E-03	4 10E-01	1 60E-04	8 93E-05	0 3	1 00E-09	8 13E-06	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 79E-01	7 00E-02	1 60E-04	4 89E-03	0 07	5 48E-08	1 12E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 89E-02	5 00E-03	1 00E-03	7 93E-04	0 3	5 55E-08	0 004	
MG/L	IRON		3 00E-01	4 50E-02		4 30E+00	1 50E-01	1 60E-04	1 19E-01	0 4	1 32E-06	2 93E-05	
MG/L	LEAD	B2				1 09E-02	1 50E-01	4 00E-06	3 00E-04		8 39E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 77E-02	7 00E-01	9 00E-03	1 31E-03	0 02	8 23E-07	1 96E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 78E-03	8 10E-01	8 40E-03	1 04E-04	0 026	6 10E-08	1 88E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 22E-02	1 00E+00	1 60E-02	6 08E-04	0 068	6 81E-07	7 56E-05	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 68E-03	1 00E+00	5 30E-03	1 58E-04	0 0052	5 78E-08	1 93E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 88E-03	6 50E-01	2 20E-02	7 89E-05	0 11	1 21E-07	2 67E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 18E-02	2 00E-01	8 90E-03	3 25E-04	0 03	2 02E-07	1 01E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 40E-02	1 00E+00	1 00E-02	3 84E-04	0 04	2 69E-07	2 69E-05	0 04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 31E-02	1 00E+00	4 80E-02	9 06E-04	0 09	3 05E-06	0 0003	0 005
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 35E-02	1 00E+00	1 00E-02	6 44E-04	0 03	4 51E-07	2 26E-05	0 03
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 62E-01	1 50E-01	1 60E-02	7 17E-03	1 2	8 03E-06	0 009	
Hazard Index													0
										Total Hazard Index =	3	0 014	0

Notes

WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds.

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.39E-05	--	--	--		3.25E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.43E-05	--	--	--		9.04E-08	
ug/m3	1,1-DICHLOROETHENE	C	3.34E-03	--	--	--		3.21E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.25E-04	--	--	--	1.40E-03	1.20E-07	8.56E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.32E-03	--	--	--		3.19E-06	
ug/m3	CHLOROFORM	B2	4.83E-04	--	--	--	0.00E+00	4.63E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.35E-04	--	--	--	1.00E-02	4.17E-07	4.17E-05
ug/m3	TETRACHLOROETHYLENE(PCI	C-B2	1.75E-03	--	--	--	1.71E-01	1.67E-06	9.79E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.00E-03	--	--	--	2.00E-02	9.62E-07	4.81E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	--	--	--		1.05E-06	
				Total ELCR:			Total HI:		
				--			0.0002		

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation.

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW31) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
MG/L									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.36E+01	1.00E-01	1.60E-04	7.43E-02		5.46E-07			
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	3.26E-03	4.10E-01	1.60E-04	1.79E-05	3E-05	1.31E-10	5E-10	3E-04	
MG/L	BARIUM	D				1.79E-01	7.00E-02	1.60E-04	9.79E-04		7.19E-09			
MG/L	CHROMIUM, TOTAL	A-D				2.89E-02	5.00E-03	1.00E-03	1.58E-04		7.27E-09			
MG/L	IRON					4.30E+00	1.50E-01	1.60E-04	2.36E-02		1.73E-07			
MG/L	LEAD	B2				1.09E-02	1.50E-01	4.00E-06	5.99E-05		1.10E-11			
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	4.77E-02	7.00E-01	9.00E-03	2.61E-04	5E-05	1.08E-07	3E-08	5E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	3.78E-03	8.10E-01	8.40E-03	2.07E-05	1E-06	7.99E-09	6E-10	1E-06	
Total Risk										2E-04	2E-07	5E-04	4E-04	
Total Risk =														

704 766

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RFDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 36E+01	1 00E-01	1 60E-04	8 67E-01	0 9	6 37E-06	6 37E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 26E-03	4 10E-01	1 60E-04	2 08E-04	0 7	1 53E-09	1 24E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 79E-01	7 00E-02	1 60E-04	1 14E-02	0 16	8 38E-08	1 71E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 89E-02	5 00E-03	1 00E-03	1 85E-03	0 6	8 48E-08	0 006	
MG/L	IRON		3 00E-01	4 50E-02		4 30E+00	1 50E-01	1 60E-04	2 75E-01	0 9	2 02E-06	4 49E-05	
MG/L	LEAD	B2				1 09E-02	1 50E-01	4 00E-06	6 99E-04		1 28E-10		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 77E-02	7 00E-01	9 00E-03	3 05E-03	0 05	1 26E-06	3 00E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 78E-03	8 10E-01	8 40E-03	2 42E-04	0 060	9 33E-08	2 88E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 22E-02	1 00E+00	1 60E-02	1 42E-03	0 16	1 04E-06	1 16E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 68E-03	1 00E+00	5 30E-03	3 63E-04	0 012	8 84E-08	2 95E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 88E-03	6 50E-01	2 20E-02	1 84E-04	0 26	1 86E-07	0 0004	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 18E-02	2 00E-01	8 90E-03	7 57E-04	0 08	3 09E-07	1 55E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 40E-02	1 00E+00	1 00E-02	8 95E-04	0 09	4 11E-07	4 11E-05	0 09
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 31E-02	1 00E+00	4 80E-02	2 12E-03	0 21	4 66E-06	0 0005	0 012
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 35E-02	1 00E+00	1 00E-02	1 50E-03	0 08	6 90E-07	3 45E-05	0 08
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 62E-01	1 50E-01	1 60E-02	1 67E-02	3	1 23E-05	0 014	
Hazard Index													0 021
										Total Hazard Index =		7	0

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

Intake for carcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$$

C_{air} =	Estimated Indoor Air Concentration (ug/m ³)
IR =	Inhalation Rate (m ³ /day)
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)
EF =	Exposure Frequency (days/year)
ED =	Exposure Duration (years)
CF =	Conversion Factor (mg/ug)
BW =	Body Weight (kg)
AT =	Averaging Time (days)

Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1 00E-03		1 00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion
 into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the
 USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	EPC	CDI	ELCR	RfDi	CDI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	2.03E-01	3.54E-05	6.30E-09	1.28E-09		9.70E-09
ug/m3	1,1,2-TRICHLOROETHANE	C	5.60E-02	9.80E-05	1.75E-08	9.77E-10		2.68E-08
ug/m3	CARBON TETRACHLORIDE	B2	5.25E-02	3.43E-03	6.12E-07	3.21E-08		9.41E-07
ug/m3	CHLOROFORM	B2	8.05E-02	5.05E-04	9.00E-08	7.25E-09	0.00E+00	1.38E-07
ug/m3	cis-1,2-DICHLOROETHYLENE	D		4.49E-04	8.00E-08		1.00E-02	1.23E-07
ug/m3	TETRACHLOROETHYLENE(PEC)	C-B2	2.00E-03	1.80E-03	3.20E-07	6.41E-10	1.71E-01	4.93E-07
ug/m3	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	1.13E-03	2.01E-07	1.21E-09		3.10E-07

Total ELCR: 4.35E-08 Total HI: 0.00002

704 768

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	CDI_{adj} =	$\frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	CDI_{adj} =	$\frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure
- $$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$
- 1.09 (L-year)/(kg-day)**
- b = USEPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female adults)
- f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure
- $$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$
- 9480 (cm²-year)/(kg)**
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

704 770

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	CDI	Ingestion ELCR	CDI	Dermal ELCR	Inhalation* ELCR
MG/L	ALUMINUM					2.70E+01	1.00E-01	1.60E-04	4.01E-01		3.92E-06		
MG/L	ARSENIC	A	1.50E+00	3.68E+00	1.51E+01	5.55E-03	4.10E-01	1.60E-04	8.25E-05	1E-04	8.07E-10	3E-09	1E-03
MG/L	BARIUM	D				5.11E-01	7.00E-02	1.60E-04	7.59E-03		7.43E-08		
MG/L	CADMIUM	B1			6.30E+00	1.52E-03	1.00E-02	1.00E-03	2.26E-05		1.38E-09		1E-04
MG/L	CHROMIUM, TOTAL	A-D				5.04E-02	5.00E-03	1.00E-03	7.49E-04		4.58E-08		
MG/L	IRON					8.66E+00	1.50E-01	1.60E-04	1.29E-01		1.26E-06		
MG/L	LEAD	B2				2.32E-02	1.50E-01	4.00E-06	3.45E-04		8.42E-11		
MG/L	MANGANESE	D				2.03E+00	4.00E-02	1.60E-04	3.02E-02		2.96E-07		
MG/L	VANADIUM					1.58E-02	1.00E-02	1.60E-04	2.34E-04		2.29E-09		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2		1.40E-02	7.37E-02	4.60E-02	1.90E-01	1.60E-04	6.84E-04	1E-05	6.69E-09	5E-10	1E-05
MG/L	1,1,2,2-TETRACHLOROETHANE	C		2.00E-01	2.86E-01	4.65E-02	7.00E-01	9.00E-03	6.92E-04	1E-04	3.81E-07	1E-07	1E-04
MG/L	1,1,2-TRICHLOROETHANE	C		5.70E-02	7.04E-02	2.53E-03	8.10E-01	8.40E-03	3.76E-05	2E-06	1.93E-08	1E-09	2E-06
MG/L	CARBON TETRACHLORIDE	B2		1.30E-01	2.00E-01	5.25E-02	2.84E-02	2.20E-02	4.22E-04	5E-05	5.68E-07	1E-07	2E-05
MG/L	CHLOROFORM	B2		6.10E-03	3.05E-02	7.43E-02	2.00E-01	8.90E-03	1.11E-03	7E-06	6.01E-07	2E-08	9E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				1.03E-02	1.00E+00	1.00E-02	1.53E-04		9.35E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2		5.20E-02	2.00E-03	2.53E-03	1.00E+00	4.80E-02	3.76E-05	2E-06	1.10E-07	6E-09	8E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2		1.10E-02	7.33E-02	6.00E-03	1.50E-01	1.60E-02	1.02E-03	1E-05	9.95E-07	7E-08	6E-06
Total Risk										3E-04	Total Risk = 2E-03		

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD)

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	Ingestion	CDI	HQ	CDI	Dermal	HQ	Inhalation*	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		2 70E+01	1 00E-01	1 60E-04	7 39E-01	0 7	8 28E-06	8 28E-05					
MG/L	ARSENIC	A	3 00E-04	1 23E-04		5 55E-03	4 10E-01	1 60E-04	1 52E-04	0 5	1 70E-09	1 38E-05					
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	5 11E-01	7 00E-02	1 60E-04	1 40E-02	0 20	1 57E-07	3 20E-05					
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 52E-03	1 00E-02	1 00E-03	4 16E-05	0 08	2 92E-09	5 83E-04					
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	5 04E-02	5 00E-03	1 00E-03	1 38E-03	0 5	9 66E-08	0 006					
MG/L	IRON		3 00E-01	4 50E-02		8 66E+00	1 50E-01	1 60E-04	2 37E-01	0 8	2 66E-06	5 90E-05					
MG/L	LEAD	B2				2 32E-02	1 50E-01	4 00E-06	6 35E-04		1 78E-10						
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 03E+00	4 00E-02	1 60E-04	5 57E-02	0 40	6 24E-07	1 11E-04					
MG/L	VANADIUM		7 00E-03	7 00E-05		1 58E-02	1 00E-02	1 60E-04	4 32E-04	0 06	4 83E-09	6 90E-05					
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		4 60E-02	1 90E-01	1 60E-04	1 26E-03	0	1 41E-08	0					
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 65E-02	7 00E-01	9 00E-03	1 28E-03	0 021	8 03E-07	1 91E-05					
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 53E-03	8 10E-01	8 40E-03	6 92E-05	0 017	4 07E-08	1 26E-05					
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 84E-02	6 50E-01	2 20E-02	7 77E-04	1 1	1 20E-06	0 0026					
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		7 43E-02	2 00E-01	8 90E-03	2 04E-03	0 2	1 27E-06	0 0006					
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 03E-02	1 00E+00	1 00E-02	2 82E-04	0 028	1 97E-07	1 97E-05				0 028	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-03	1 00E+00	4 80E-02	6 93E-05	0 007	2 33E-07	2 33E-05				4 05E-04	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 84E-02	1 50E-01	1 60E-02	1 87E-03	0 31	2 10E-06	0 0023				0 0023	
Hazard Index																	
										Total Hazard Index =		5					
										0.013		5					

Notes:

WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$			
		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC
IR =	Inhalation Rate (m ³ /day)	NA	15
EF =	Exposure Frequency (days/year)	NA	350
ED =	Exposure Duration (years)	NA	6
CF =	Conversion Factor (mg/ug)	NA	1.00E-03
BW =	Body Weight (kg)	NA	15
AT =	Averaging Time (days)	NA	2190

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.5E-05	--	--	--		3.4E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.8E-05	--	--	--		9.4E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.4E-03	--	--	--		3.3E-06	
ug/m3	CHLOROFORM	B2	5.1E-04	--	--	--	0.0E+00	4.8E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.5E-04	--	--	--	1.0E-02	4.3E-07	4.31E-05
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.8E-03	--	--	--	1.7E-01	1.7E-06	1.01E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	--	--	--		1.1E-06	
Total ELCR:				--			Total HI: 0.0001		

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW32) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
 Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SF ₀	SF _d	SF _i	EPC	ABSG _i	PC	Intest _{ion} CDI	ELCR	Dermal CDI	ELCR	Inhalation [*] ELCR
MG/L	ALUMINIUM					2.70E+01	1.00E-01	1.60E-04	1.48E-01		1.09E-06		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	5.55E-03	4.10E-01	1.60E-04	3.04E-05	5E-05	2.23E-10	8E-10	5E-04
MG/L	BARIUM	D				5.11E-01	7.00E-02	1.60E-04	2.80E-03		2.05E-08		
MG/L	CADMIUM	B1			6.30E+00	1.52E-03	1.00E-02	1.00E-03	8.33E-06		3.82E-10		5E-05
MG/L	CHROMIUM, TOTAL	A-D				5.04E-02	5.00E-03	1.00E-03	2.76E-04		1.27E-08		
MG/L	IRON					8.66E+00	1.50E-01	1.60E-04	4.74E-02		3.48E-07		
MG/L	LEAD	B2				2.32E-02	1.50E-01	4.00E-06	1.27E-04		2.33E-11		
MG/L	MANGANESE	D				2.03E+00	4.00E-02	1.60E-04	1.11E-02		8.18E-08		
	Total Risk									1E-04		9E-08	6E-04
												Total Risk =	7E-04

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MG/L	ALUMINIUM		1 00E+00	1 00E-01		2 70E+01	1 00E-01	1 60E-04	1 72E+00	1 7	1 27E-05	1 27E-05	1 27E-04
MG/L	ARSENIC	A	3 00E-04	1 23E-04		5 55E-03	4 10E-01	1 60E-04	3 55E-04	1 2	2 60E-09	2 12E-05	2 12E-05
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	5 11E-01	7 00E-02	1 60E-04	3 28E-02	0 5	2 40E-07	4 89E-05	0 5
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 52E-03	1 00E-02	1 00E-03	9 72E-05	0 19	4 46E-09	0 0009	0 0009
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	5 04E-02	5 00E-03	1 00E-03	3 22E-03	1 1	1 48E-07	0 010	0 010
MG/L	IRON		3 00E-01	4 50E-02		8 66E+00	1 50E-01	1 60E-04	5 53E-01	1 8	4 06E-06	9 03E-05	9 03E-05
MG/L	LEAD	B2				2 32E-02	1 50E-01	4 00E-06	1 48E-03		2 72E-10		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 03E+00	4 00E-02	1 60E-04	1 30E-01	0 9	9 55E-07	1 70E-04	1 70E-04
MG/L	VANADIUM		7 00E-03	7 00E-05		1 58E-02	1 00E-02	1 60E-04	1 01E-03	0 14	7 39E-09	1 06E-04	1 06E-04
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		4 60E-02	1 90E-01	1 60E-04	2 94E-03	0	2 16E-08	0	0
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 65E-02	7 00E-01	9 00E-03	2 98E-03	0 05	1 23E-06	2 93E-05	2 93E-05
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 53E-03	8 10E-01	8 40E-03	1 61E-04	0 040	6 23E-08	1 92E-05	1 92E-05
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 84E-02	6 50E-01	2 20E-02	1 81E-03	2 6	1 83E-06	0 0040	0 0040
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		7 43E-02	2 00E-01	8 90E-03	4 75E-03	0 5	1 94E-06	0 0010	0 0010
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 03E-02	1 00E+00	1 00E-02	6 58E-04	0 07	3 02E-07	3 02E-05	0 07
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-03	1 00E+00	4 80E-02	1 62E-04	0 016	3 56E-07	3 56E-05	0 0009
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 84E-02	1 50E-01	1 60E-02	4 37E-03	0 7	3 21E-06	0 0036	0 0036
Hazard Index										12	0 020	12	0

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = if

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$C_{air} * IR_{adj} * EF * CF$$

C_{air} =	Estimated Indoor Air Concentration (ug/m ³)
IR =	Inhalation Rate (m ³ /day)
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)
EF =	Exposure Frequency (days/year)
ED =	Exposure Duration (years)
CF =	Conversion Factor (mg/ug)
BW =	Body Weight (kg)
AT =	Averaging Time (days)

AT			
Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1.00E-03		1.00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	1.3E-05	2.0E-01	2.3E-09	4.6E-10		3.5E-09	

Total ELCR: 4.63E-10 Total HI: 0.0000

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
CDI =	Age-specific intake (for carcinogenic compounds only).	
$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds.		
CDI =	Age-specific intake (for carcinogenic compounds only)	
$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation:

CDI = Ingestion CDI from above ^f

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"

OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWA} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWA} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.11E+01	1.00E-01	1.60E-04	1.68E-01					
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	6.37E-03	4.10E-01	1.60E-04	9.47E-05	1E-04	9.26E-10	3E-09		
MG/L	BARIUM	D				1.18E-01	7.00E-02	1.60E-04	1.75E-03		1.71E-08			
MG/L	CHROMIUM, TOTAL	A-D				2.12E-02	5.00E-03	1.00E-03	3.15E-04		1.92E-08			
MG/L	IRON					2.88E+00	1.50E-01	1.60E-04	4.29E-02		4.19E-07			
MG/L	LEAD	B2				9.72E-03	1.50E-01	4.00E-06	1.45E-04		3.53E-11			
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.23E-03	7.00E-01	9.00E-03	3.32E-05	7E-06	1.83E-08	5E-09	7E-06	
	Total Risk									1E-04		9E-09	2E-04	7E-06

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Total Risk = 2E-04

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	Ingestion	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.11E+01	1.00E-01	1.60E-04	3.05E-01	0.3	3.42E-06	3.42E-05		3.42E-06	3.42E-05		
MG/L	ARSENIC	A	3.00E-04	1.23E-04		6.37E-03	4.10E-01	1.60E-04	1.74E-04	0.6	1.95E-09	1.59E-05		1.95E-09	1.59E-05		
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	1.18E-01	7.00E-02	1.60E-04	3.23E-03	0.05	3.61E-08	7.37E-06		3.61E-08	7.37E-06		
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1.50E-05	2.86E-05	2.12E-02	5.00E-03	1.00E-03	5.80E-04	0.2	4.06E-08	0.003		4.06E-08	0.003		
MG/L	IRON		3.00E-01	4.50E-02		2.88E+00	1.50E-01	1.60E-04	7.90E-02	0.26	8.85E-07	1.97E-05		8.85E-07	1.97E-05		
MG/L	LEAD	B2				9.72E-03	1.50E-01	4.00E-06	2.66E-04		7.45E-11			7.45E-11			
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2.23E-03	7.00E-01	9.00E-03	6.12E-05	0.0010	3.86E-08	9.18E-07		3.86E-08	9.18E-07		
	Hazard Index									1.4					0.003		

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic		Noncarcinogenic	
				SFI	CDI	RfDI	CDI
ug/m3	1,1,1,2,2-TETRACHLOROETHANE	C	1.3E-05	--	--	--	1.2E-08
Total ELCR:				--	--	Total HI: 0.000	

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997.
- Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW33) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	CDI	Ingestion ELCR	CDI	Dermal ELCR	Inhalation* ELCR
MG/L	ALUMINIUM					1.11E+01	1.00E-01	1.60E-04	6.10E-02		4.48E-07		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	6.37E-03	4.10E-01	1.60E-04	3.49E-05	5E-05	2.56E-10	9E-10	5E-04
MG/L	BARIUM	D				1.18E-01	7.00E-02	1.60E-04	6.45E-04		4.74E-09		
MG/L	CHROMIUM, TOTAL	A-D				2.12E-02	5.00E-03	1.00E-03	1.16E-04		5.32E-09		
MG/L	IRON					2.88E+00	1.50E-01	1.60E-04	1.58E-02		1.16E-07		
MG/L	LEAD	B2				9.72E-03	1.50E-01	4.00E-06	5.32E-05		9.78E-12		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.23E-03	7.00E-01	9.00E-03	1.22E-05	2E-06	5.06E-09	1E-09	2E-06
Total Risk										5E-05	Total Risk =		
											2E-09	6E-04	5E-04

704 786

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RTDo	RTDd	RfDI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
MG/L									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINIUM		1 00E+00	1 00E-01		1 11E+01	1 00E-01	1 60E-04	7 12E-01	0 7	5 23E-06	5 23E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		6 37E-03	4 10E-01	1 60E-04	4 07E-04	1 4	2 99E-09	2 43E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 18E-01	7 00E-02	1 60E-04	7 53E-03	0 11	5 53E-08	1 13E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 12E-02	5 00E-03	1 00E-03	1 35E-03	0 5	6 21E-08	0 004	
MG/L	IRON		3 00E-01	4 50E-02		2 88E+00	1 50E-01	1 60E-04	1 84E-01	0 6	1 35E-06	3 01E-05	
MG/L	LEAD	B2				9 72E-03	1 50E-01	4 00E-06	6 21E-04		1 14E-10		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		2 23E-03	7 00E-01	9 00E-03	1 43E-04	0 0024	5 90E-08	1 40E-06	
	Hazard Index									3		0.004	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW37) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
Age-specific intake (for carcinogenic compounds only)		
CDI = $\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	CDI_{adj} = $\frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
IR = Ingestion Rate (L/day)	N/A	2 a
IR_{adj} = Age-adjusted Ingestion Rate (L-year/kg-day)	11 b	N/A
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a
Dermal:		
Intake for non-carcinogenic compounds.		
Age-specific intake (for carcinogenic compounds only):		
CDI = $\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	CDI_{adj} = $\frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
SA = Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} = Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC = Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET = Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
CF = Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure
- $$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$
- 1.09 (L-year)/(kg-day)**
- b = USEPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female adults)
- f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure
- $$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$
- 9480 (cm²-year)/(kg)**
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 788

Offsite Groundwater (MW327) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)

Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	BARIUM	D				6.39E-01	7.00E-02	1.60E-04	3.50E-03		2.57E-08			
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7.13E-03	1.90E-01	1.60E-04	3.90E-05		2.87E-10			
MG/L	CHROMIUM, TOTAL	D			4.10E+01	7.71E-03	5.00E-03	1.00E-03	4.22E-05		1.94E-09			2E-03
MG/L	MANGANESE	D				1.88E-01	4.00E-02	1.60E-04	1.03E-03		7.58E-09			
Total Risk														2E-03
Total Risk =												2E-03		

Offsite Groundwater (MW327) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion		Dermal		Inhalation*
MG/L									CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 40E-04	6 39E-01	7 00E-02	1 60E-04	4 08E-02	0 58	3 00E-07	6 12E-05	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7 13E-03	1 90E-01	1 60E-04	4 55E-04		3 34E-09		
MG/L	CHROMIUM, TOTAL	D	3 00E-03	1 50E-05	3 00E-05	7 71E-03	5 00E-03	1 00E-03	4 93E-04	0 16	2 26E-08	0 0015	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	1 88E-01	4 00E-02	1 60E-04	1 20E-02	0 086	8 84E-08	1 58E-05	
	Hazard Index									0.8		0.0016	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Total Hazard Index = 0.8

Offsite Groundwater (MW37) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds.		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW327) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	Sf0	Sfd	Sf1	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
									CDI	ELCR	CDI	ELCR	ELCR
MG/L	BARIUM	D				6.39E-01	7.00E-02	1.60E-04	3.50E-03		2.57E-08		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7.13E-03	1.90E-01	1.60E-04	3.90E-05		2.87E-10		
MG/L	CHROMIUM, TOTAL	D			4.10E+01	7.71E-03	5.00E-03	1.00E-03	4.22E-05		1.94E-09		2E-03
MG/L	MANGANESE	D				1.88E-01	4.00E-02	1.60E-04	1.03E-03		7.58E-09		
Total Risk = 2E-03													2E-03

704 792

Offsite Groundwater (MW327) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.40E-04	6.39E-01	7.00E-02	1.60E-04	4.08E-02	0.58	3.00E-07	6.12E-05	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7.13E-03	1.90E-01	1.60E-04	4.55E-04		3.34E-09		
MG/L	CHROMIUM, TOTAL	D	3.00E-03	1.50E-05	3.00E-05	7.71E-03	5.00E-03	1.00E-03	4.93E-04	0.16	2.26E-08	0.0015	
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	1.88E-01	4.00E-02	1.60E-04	1.20E-02	0.086	8.84E-08	1.58E-05	
	Hazard Index									0.8		0.0016	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index; * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic			
			EPC	SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	1.8E-03	1.8E-01	3.3E-07	5.7E-08			5.0E-07

Total ELCR: 5.70E-08 Total HI: 0.0000

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	CDI_{adj} =	$\frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds.		Age-specific intake (for carcinogenic compounds only).	
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	CDI_{adj} =	$\frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"

OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletin, Human Health Risk Assessment, Interim, November 1995.

704 796

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	Woe	Sf0	Sfd	Sfi	Epc	Absgl	Pc	Ingestion		Dermal		Inhalation*	
									Cdi	Elcr	Cdi	Elcr	Cdi	Elcr
MG/L	BARIUM	D				3.54E-01	7.00E-02	1.60E-04	5.28E-03				5.14E-08	
MG/L	MANGANESE	D				1.07E+00	4.00E-02	1.60E-04	1.58E-02				1.55E-07	
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	2.30E-03	1.00E+00	1.60E-02	3.41E-05	2E-05			2E-08	6E-06
Total Risk										2E-05			2E-08	6E-06

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Total Risk = 3E-05

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	Ingestion	CDI	HQ	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	3.54E-01	7.00E-02	1.60E-04	9.68E-03	0.14	1.08E-07	2.21E-05	1.08E-07	2.21E-05					
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	1.07E+00	4.00E-02	1.60E-04	2.92E-02	0.21	3.27E-07	5.84E-05	3.27E-07	5.84E-05					
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		2.30E-03	1.00E+00	1.60E-02	6.29E-05	0.0070	7.04E-08	7.82E-06	7.04E-08	7.82E-06					
	Hazard Index									0.35					8.83E-05				

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Total Hazard Index = 0.35

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

CDI= $\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$			
		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC b
IR =	Inhalation Rate (m ³ /day)	NA	15 a
EF =	Exposure Frequency (days/year)	NA	350 a
ED =	Exposure Duration (years)	NA	6 a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03
BW =	Body Weight (kg)	NA	15 a
AT =	Averaging Time (days)	NA	2190 a

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	1.8E-03	--	--	--	--	1.8E-06	--
Total ELCR:				--	--	Total HI:		0.000	

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW40) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	BARIUM	D				3.54E-01	7.00E-02	1.60E-04	1.94E-03				1.42E-08	
MG/L	MANGANESE	D				1.07E+00	4.00E-02	1.60E-04	5.84E-03				4.29E-08	
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	2.30E-03	1.00E+00	1.60E-02	1.26E-05	8E-06	9.24E-09	6E-09	2E-06	
Total Risk										8E-06		6E-09	2E-06	
										Total Risk =		1E-05		

704 801

704 802

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	HQ	CDI	HQ	CDI	HQ
MG/L	BARIUM	D	7.00E-02	4.90E-03	1.43E-04	3.54E-01	7.00E-01	1.60E-04	2.26E-02	0.32	1.66E-07	3.39E-05		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	1.07E+00	4.00E-02	1.60E-04	6.81E-02	0.49	5.00E-07	8.93E-05		
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		2.30E-03	1.00E+00	1.60E-02	1.47E-04	0.016	1.08E-07	1.20E-05		
Hazard Index										0.83	1.35E-04			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Total Hazard Index = 0.83

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	CDI_{adj} =	$\frac{C_{gw} * EF * CF * IR_{adj}}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	CDI_{adj} =	$\frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDA - EDc)}{BWA} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDA - EDc)}{BWA} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

704 804

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	CADMIUM	B1			6.30E+00	2.09E-03	1.00E-02	1.00E-03	3.11E-05				1.90E-09	
MG/L	MANGANESE	D				3.83E-01	4.00E-02	1.60E-04	5.70E-03				5.57E-08	
Total Risk														

Total Risk =

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	HQ	CDI	HQ	Inhalation*
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.09E-03	1.00E-02	1.00E-03	5.73E-05	0.11	4.01E-09	0.0008	
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	3.83E-01	4.00E-02	1.60E-04	1.05E-02	0.075	1.18E-07	2.10E-05	
	Hazard Index									0.19		0.0008	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Total Hazard Index = 0.19

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW42) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	CADMIUM	B1			6.30E+00	2.09E-03	1.00E-02	1.00E-03	1.15E-05		5.26E-10		7E-05	
MG/L	MANGANESE	D				3.83E-01	4.00E-02	1.60E-04	2.10E-03		1.54E-08			

Total Risk

Total Risk = 7E-05

704 808

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	HQ	CDI	HQ	Inhalation*
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		2.09E-03	1.00E-02	1.00E-03	1.34E-04	0.27	6.13E-09	0.0012	
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	3.83E-01	4.00E-02	1.60E-04	2.45E-02	0.17	1.80E-07	3.21E-05	
	Hazard Index									0.44		0.0013	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Total Hazard Index = 0.44

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

Intake for carcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$$

C_{air} = Estimated Indoor Air Concentration (ug/m³)
IR = Inhalation Rate (m³/day)
IR_{adj} = Adjusted Inhalation Rate (m³-yr)/(kg-day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
CF = Conversion Factor (mg/ug)
BW = Body Weight (kg)
AT = Averaging Time (days)

Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1.00E-03		1.00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	BROMODICHLOROMETHANE	B2	1.0E-04		1.8E-08			2.8E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.7E-03	5.3E-02	6.5E-07	3.4E-08		1.0E-06	
ug/m3	CHLOROFORM	B2	5.4E-04	8.1E-02	9.6E-08	7.7E-09	0.0E+00	1.5E-07	
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.9E-03	2.0E-03	3.4E-07	6.9E-10	1.7E-01	5.3E-07	3.09E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.2E-03	6.0E-03	2.2E-07	1.3E-09		3.3E-07	

Total ELCR: 4.40E-08 Total HI: 0.000003

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds.		
CDI =	Age-specific intake (for carcinogenic compounds only)	
$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
IR = Ingestion Rate (L/day)	N/A	2 a
IR_{adj} = Age-adjusted Ingestion Rate (L-year/kg-day)	11 b	N/A
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a
Dermal:		
Intake for non-carcinogenic compounds		
CDI =	Age-specific intake (for carcinogenic compounds only).	
$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
SA = Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} = Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC = Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET = Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
CF = Conversion Factor (L/cm ³)	1.00E-03	1.00E-03
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.
- $$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (EDA - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$
- 1.09 (L-year)/(kg-day)**
- b = USEPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female adults)
- f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure
- $$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (EDA - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$
- 9480 (cm²-year)/(kg)**
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS, Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

704 812

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					4.33E+00	1.00E-01	1.60E-04	6.43E-02					
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	8.69E-03	4.10E-01	1.60E-04	1.29E-04	2E-04	6.29E-07			
MG/L	CADMIUM	B1			6.30E+00	1.56E-03	1.00E-02	1.00E-03	2.32E-05		1.26E-09	5E-09		
MG/L	IRON					1.10E+01	1.50E-01	1.60E-04	1.63E-01		1.42E-09			
MG/L	MANGANESE	D				3.88E-01	4.00E-02	1.60E-04	5.76E-03		1.59E-06			
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6.33E-02		2.32E-03	9.80E-01	5.80E-03	3.45E-05		5.64E-08			
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2.94E-03	6.50E-01	2.20E-02	4.37E-05	2E-06	1.22E-08	8E-10		
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	2.63E-03	2.00E-01	8.90E-03	3.92E-05	6E-06	5.88E-08	1E-08	2E-06	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	2.57E-03	1.00E+00	4.80E-02	3.82E-05	2E-06	1.12E-07	6E-09	3E-06	
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.09E-03	1.50E-01	1.60E-02	3.11E-05	3E-07	3.04E-08	2E-09	8E-08	
Total Risk										2E-04	Total Risk =		3E-08	6E-06
													2E-04	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = Inhalation intake (CD)

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		4 33E+00	1 00E-01	1 60E-04	1 18E-01	0 12	1 33E-06	1 33E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		8 69E-03	4 10E-01	1 60E-04	2 38E-04	0 8	2 67E-09	2 17E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 56E-03	1 00E-02	1 00E-03	4 27E-05	0 09	2 99E-09	0 0006	
MG/L	IRON		3 00E-01	4 50E-02		1 10E+01	1 50E-01	1 60E-04	3 00E-01	1 0	3 36E-06	7 48E-05	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	3 88E-01	4 00E-02	1 60E-04	1 08E-02	0 08	1 19E-07	2 12E-05	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		2 32E-03	9 80E-01	5 80E-03	6 36E-05	0 0032	2 58E-08	1 32E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 94E-03	6 50E-01	2 20E-02	8 05E-05	0 12	1 24E-07	2 72E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		2 63E-03	2 00E-01	8 90E-03	7 21E-05	0 007	4 49E-08	2 25E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 57E-03	1 00E+00	4 80E-02	7 04E-05	0 007	2 37E-07	2 37E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 09E-03	1 50E-01	1 60E-02	5 72E-05	0 010	6 41E-08	7 12E-05	
Hazard Index										2.2	0.0011		

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Total Hazard Index = 2.2

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	BROMODICHLOROMETHANE	B2	1.0E-04	--	--	--	--	9.9E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.7E-03	--	--	--	--	3.5E-06	
ug/m3	CHLOROFORM	B2	5.4E-04	--	--	--	0.0E+00	5.1E-07	
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.9E-03	--	--	--	1.7E-01	1.8E-06	1.08E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.2E-03	--	--	--	--	1.2E-06	
Total ELCR:				--	Total HI: 0.00001				

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW44) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

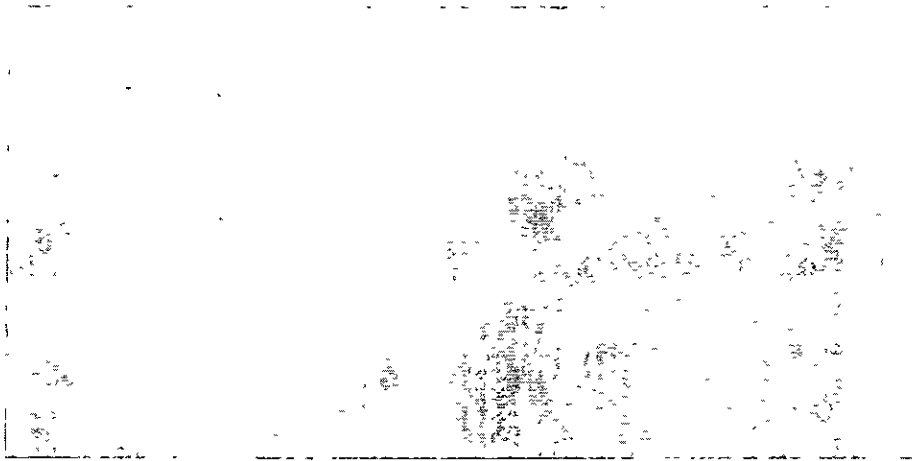
Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	CDI	Ingestion ELCR	Dermal CDI	Inhalation* ELCR
MG/L	ALUMINUM					4.33E+00	1.00E-01	1.60E-04	2.37E-02		1.74E-07	
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	8.69E-03	4.10E-01	1.60E-04	4.76E-05	7E-05	3.50E-10	1E-09
MG/L	CADMIUM	B1			6.30E+00	1.56E-03	1.00E-02	1.00E-03	8.55E-06		3.92E-10	7E-04
MG/L	IRON					1.10E+01	1.50E-01	1.60E-04	6.01E-02		4.41E-07	5E-05
MG/L	MANGANESE	D				3.88E-01	4.00E-02	1.60E-04	2.12E-03		1.56E-08	
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6.33E-02		2.32E-03	9.80E-01	5.80E-03	1.27E-05	8E-07	3.38E-09	2E-10
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2.94E-03	6.50E-01	2.20E-02	1.61E-05	2E-06	1.63E-08	3E-09
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	2.63E-03	2.00E-01	8.90E-03	1.44E-05	9E-08	5.89E-09	2E-10
	Total Risk									8E-05	7E-09	8E-04
										Total Risk =	9E-04	

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDI	EPC	ABSGI	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		4.33E+00	1.00E-01	1.60E-04	2.76E-01	0.28	2.03E-06	2.03E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		8.69E-03	4.10E-01	1.60E-04	5.56E-04	1.9	4.08E-09	3.32E-05	
MG/L	CADMIUM	B1	5.00E-04	5.00E-06		1.56E-03	1.00E-02	1.00E-03	9.97E-05	0.20	4.58E-09	0.0009	
MG/L	IRON		3.00E-01	4.50E-02		1.10E+01	1.50E-01	1.60E-04	7.01E-01	2.3	5.15E-06	1.14E-04	
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1.43E-05	3.88E-01	4.00E-02	1.60E-04	2.48E-02	0.18	1.82E-07	3.25E-05	
MG/L	BROMODICHLOROMETHANE	B2	2.00E-02	1.96E-02		2.32E-03	9.80E-01	5.80E-03	1.48E-04	0.0074	3.95E-08	2.01E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		2.94E-03	6.50E-01	2.20E-02	1.88E-04	0.27	1.90E-07	4.17E-04	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		2.63E-03	2.00E-01	8.90E-03	1.68E-04	0.017	6.88E-08	3.44E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	2.57E-03	1.00E+00	4.80E-02	1.64E-04	0.016	3.62E-07	3.62E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		2.09E-03	1.50E-01	1.60E-02	1.34E-04	0.022	9.80E-08	1.09E-04	
Hazard Index										5	0.0017	5	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = Ir

704 820



Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

Intake for carcinogenic compounds.

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$$

C_{air} =	Estimated Indoor Air Concentration (ug/m ³)
IR =	Inhalation Rate (m ³ /day)
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)
EF =	Exposure Frequency (days/year)
ED =	Exposure Duration (years)
CF =	Conversion Factor (mg/ug)
BW =	Body Weight (kg)
AT =	Averaging Time (days)

Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1.00E-03		1.00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			EPC	SFI	CDI	ELCR	RfDI	CDI
ug/m3	1,1-DICHLOROETHENE	C	4.9E-03	1.8E-01	8.8E-07	1.5E-07		1.3E-06
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	2.6E-03	2.0E-03	4.7E-07	9.4E-10	1.7E-01	7.2E-07
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.6E-03	6.0E-03	2.9E-07	1.7E-09		4.5E-07

Total ELCR: 1.56E-07 Total HI: 3.72E+04

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
CDI = $\frac{C_{gw} * IR * EF * ED}{BW * AT}$	Age-specific intake (for carcinogenic compounds only)	
	CDI_{adj} = $\frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds		
CDI = $\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	Age-specific intake (for carcinogenic compounds only).	
	CDI_{adj} = $\frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors"

OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{Bwa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{Bwa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SF _o	SF _d	SF _i	EPC	ABS _g	PC	Ingestion CDI	ELCR	Dermal CDI	ELCR	Inhalation* ELCR
MG/L	ALUMINUM					1.32E+00	1.00E-01	1.60E-04	1.97E-02		1.92E-07		
MG/L	IRON					3.21E+00	1.50E-01	1.60E-04	4.78E-02		4.67E-07		
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	1.67E-02	1.00E+00	1.60E-02	2.48E-04	1E-04	2.43E-07	1E-07	4E-05
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.72E-03	1.00E+00	4.80E-02	2.56E-05	1E-06	7.51E-08	4E-09	5E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	6.89E-03	1.50E-01	1.60E-02	1.02E-04	1E-06	1.00E-07	7E-09	6E-07
Total Risk										2E-04	2E-07	2E-07	4E-05

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CDI)

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Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
MG/L									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM	1.00E+00	1.00E-01			1.32E+00	1.00E-01	1.60E-04	3.62E-02	0.04	4.05E-07	4.05E-06	
MG/L	IRON	3.00E-01	4.50E-02			3.21E+00	1.50E-01	1.60E-04	8.80E-02	0.3	9.86E-07	2.19E-05	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		1.67E-02	1.00E+00	1.60E-02	4.57E-04	0.05	5.12E-07	5.69E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	1.72E-03	1.00E+00	4.80E-02	4.71E-05	0.0047	1.58E-07	1.58E-05	2.76E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		6.89E-03	1.50E-01	1.60E-02	1.89E-04	0.031	2.11E-07	2.35E-04	
Hazard Index										0.4	3.34E-04	2.76E-04	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Total Hazard Index = 0.4

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Child Scenario*Dunn Field, Defense Depot Memphis, Tennessee***Inhalation**

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	4.9E-03	--	--	--		4.7E-06	
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	2.6E-03	--	--	--	1.7E-01	2.5E-06	1.48E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.6E-03	--	--	--		1.6E-06	
				Total ELCR:			--	Total HI: 1.48E-05	

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds.		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Dermal:

Intake for non-carcinogenic and carcinogenic compounds.

CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above ^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW51) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	ALUMINUM					1.32E+00	1.00E-01	1.60E-04	7.24E-03				5.32E-08	
MG/L	IRON					3.21E+00	1.50E-01	1.60E-04	1.76E-02				1.29E-07	
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	1.67E-02	1.00E+00	1.60E-02	9.14E-05	5E-05			6.71E-08	2E-05
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.72E-03	1.00E+00	4.80E-02	9.43E-06	5E-07			2.08E-08	2E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	6.89E-03	1.50E-01	1.60E-02	3.78E-05	4E-07			2.77E-08	2E-07
Total Risk										6E-05			4E-08	2E-05
										Total Risk =		7E-05		

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1.32E+00	1.00E-01	1.60E-04	8.45E-02	0.08	6.20E-07	6.20E-06	
MG/L	IRON		3.00E-01	4.50E-02		3.21E+00	1.50E-01	1.60E-04	2.05E-01	0.7	1.51E-06	3.35E-05	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03		1.67E-02	1.00E+00	1.60E-02	1.07E-03	0.12	7.83E-07	8.70E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	1.72E-03	1.00E+00	4.80E-02	1.10E-04	0.011	2.42E-07	2.42E-05	0.0006
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		6.89E-03	1.50E-01	1.60E-02	4.41E-04	0.073	3.24E-07	3.59E-04	
	Hazard Index									1.0		5.10E-04	0.0006

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = Ir

Total Hazard Index = 1.0

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

CDI=	$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$			
		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA		20	a
IR =	Inhalation Rate (m ³ /day)	13	a,c	NA	
IRadj =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)	350	a	350	a
EF =	Exposure Frequency (days/year)	NA	a	30	a
ED =	Exposure Duration (years)	1 00E-03		1 00E-03	
CF =	Conversion Factor (mg/ug)	NA	a	70	a
BW =	Body Weight (kg)	25550	a	10950	a
AT =	Averaging Time (days)				

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	Carcinogenic			Noncarcinogenic		
			SFI	EPC	CDI	ELCR	RfDI	CDI
ug/m3	1,1,1,2-TETRACHLOROETHANE	C	2.0E-01	3.8E-05	6.7E-09	1.4E-09		1.0E-08
ug/m3	1,1,2-TRICHLOROETHANE	C	5.6E-02	1.0E-04	1.8E-08	1.0E-09		2.8E-08
ug/m3	BENZENE	A	2.7E-02	7.1E-04	1.3E-07	3.4E-09	1.7E-03	1.9E-07
ug/m3	CARBON TETRACHLORIDE	B2	5.3E-02	3.5E-03	6.2E-07	3.3E-08		9.6E-07
ug/m3	CHLOROFORM	B2	8.1E-02	5.6E-04	1.0E-07	8.1E-09	0.0E+00	1.5E-07
ug/m3	cis-1,2-DICHLOROETHYLENE	D		4.55E-04	8.11E-08		1.00E-02	1.25E-07
ug/m3	TETRACHLOROETHYLENE(PCB)	C-B2	2.00E-03	1.80E-03	3.20E-07	6.40E-10	1.71E-01	4.92E-07
ug/m3	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	1.16E-03	2.06E-07	1.24E-09		3.17E-07
Total ELCR:			4.84E-08			Total HI: 0.0001		

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds:		
$CDI = \frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only)	
	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
IR = Ingestion Rate (L/day)	N/A	2 a
IR_{adj} = Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a
Dermal:		
Intake for non-carcinogenic compounds		
$CDI = \frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only):	
	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C_{gw} = Concentration in groundwater (mg/L)	EPC	EPC
SA = Surface Area (cm ²)	N/A	20000 b,c
SA_{adj} = Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c	N/A
PC = Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET = Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF = Exposure Frequency (day/year)	350 a	350 a
ED = Exposure Duration (year)	30 a	30 a
CF = Conversion Factor (L/cm ³)	1 00E-03	1 00E-03
BW = Body Weight (kg)	70 a	70 a
AT = Averaging Time (days)	25550 a	10950 a

Inhalation:

$CDI =$ Ingestion CDI from above^f

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors"

OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SfO	SfD	SfI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	IRON					5.49E+00	1.50E-01	1.60E-04	8.17E-02		7.99E-07			
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	9.10E-03	7.00E-01	9.00E-03	1.35E-04	3E-05	7.45E-08	2E-08	3E-05	3E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.37E-03	8.10E-01	8.40E-03	3.53E-05	2E-06	1.81E-08	1E-09	2E-06	2E-06
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.22E-03	9.70E-01	2.10E-02	3.30E-05	2E-06	4.23E-08	2E-09	9E-07	9E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	6.14E-03	6.50E-01	2.20E-02	9.13E-05	1E-05	1.23E-07	2E-08	5E-06	5E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	6.24E-03	2.00E-01	8.90E-03	9.28E-05	6E-07	5.05E-08	2E-09	7E-06	7E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				1.51E-02	1.00E+00	1.00E-02	2.25E-04		1.37E-07			
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.87E-03	1.00E+00	4.80E-02	2.78E-05	1E-06	8.15E-08	4E-09	6E-08	6E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	6.14E-02	1.50E-01	1.60E-02	9.13E-04	1E-05	8.93E-07	7E-08	5E-06	5E-06
Total Risk										5E-05	1E-07	1E-04	5E-05	5E-05

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD) **Total Risk = 1E-04**

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RFDo	RFDD	RfDI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
MG/L									CDI	HQ	CDI	HQ	HQ
MG/L	IRON		3 00E-01	4 50E-02		5 49E+00	1 50E-01	1 60E-04	1 51E-01	0.5	1 69E-06	3 75E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		9 10E-03	7 00E-01	9 00E-03	2 49E-04	0.004	1 57E-07	3 74E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 37E-03	8 10E-01	8 40E-03	6 50E-05	0.0163	3 82E-08	1 18E-05	
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	2 22E-03	9 70E-01	2 10E-02	6 08E-05	0.0203	8 93E-08	3 07E-05	0.0357
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		6 14E-03	6 50E-01	2 20E-02	1 88E-04	0.24	2 59E-07	0.0006	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6 24E-03	2 00E-01	8 90E-03	1 71E-04	0.017	1 07E-07	5 33E-05	
MG/L	CS-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 51E-02	1 00E+00	1 00E-02	4 14E-04	0.041	2 90E-07	2 90E-05	0.041
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 87E-03	1 00E+00	4 80E-02	5 11E-05	0.0051	1 72E-07	1 72E-05	2.99E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 14E-02	1 50E-01	1 60E-02	1 68E-03	0.28	1 88E-06	0.0021	
Hazard Index										1.1	0.0028	0.1	
Total Hazard Index =										1.2			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	
		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC
IR =	Inhalation Rate (m ³ /day)	NA	15
EF =	Exposure Frequency (days/year)	NA	350
ED =	Exposure Duration (years)	NA	6
CF =	Conversion Factor (mg/ug)	NA	1 00E-03
BW =	Body Weight (kg)	NA	15
AT =	Averaging Time (days)	NA	2190

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.79E-05	--	--	--	--	3.63E-08	--
ug/m3	1,1,2-TRICHLOROETHANE	C	1.03E-04	--	--	--	--	9.91E-08	--
ug/m3	BENZENE	A	7.10E-04	--	--	--	1.70E-03	6.81E-07	4.00E-04
ug/m3	CARBON TETRACHLORIDE	B2	3.50E-03	--	--	--	--	3.35E-06	--
ug/m3	CHLOROFORM	B2	5.62E-04	--	--	--	0.00E+00	5.39E-07	--
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.55E-04	--	--	--	1.00E-02	4.36E-07	4.36E-05
ug/m3	TETRACHLOROETHYLENE(PCF	C-B2	1.80E-03	--	--	--	1.71E-01	1.72E-06	1.01E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.16E-03	--	--	--	--	1.11E-06	--
Total ELCR:						--	Total HI: 0.0005		

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b, e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997.
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW54) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
									CDI	ELCR	CDI	ELCR	ELCR
MG/L	IRON					5.49E+00	1.50E-01	1.60E-04	3.01E-02		2.21E-07		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	9.10E-03	7.00E-01	9.00E-03	4.99E-05	1E-05	2.06E-08	6E-09	1E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.37E-03	8.10E-01	8.40E-03	1.30E-05	7E-07	5.01E-09	4E-10	7E-07
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.22E-03	9.70E-01	2.10E-02	1.22E-05	7E-07	1.17E-08	7E-10	3E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	6.14E-03	6.50E-01	2.20E-02	3.36E-05	4E-06	3.40E-08	7E-09	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	6.24E-03	2.00E-01	8.90E-03	3.42E-05	2E-07	1.40E-08	4E-10	3E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				1.51E-02	1.00E+00	1.00E-02	8.29E-05		3.80E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	1.87E-03	1.00E+00	4.80E-02	1.02E-05	5E-07	2.25E-08	1E-09	2E-08
	Total Risk									2E-05		3E-08	2E-05
											Total Risk =	4E-05	

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	HQ	CDI	HQ	Inhalation*
MG/L	IRON		3.00E-01	4.50E-02		5.49E+00	1.50E-01	1.60E-04	3.51E-01	1.2	2.58E-06	5.73E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		9.10E-03	7.00E-01	9.00E-03	5.82E-04	0.010	2.40E-07	5.72E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.37E-03	8.10E-01	8.40E-03	1.52E-04	0.038	5.85E-08	1.81E-05	
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.22E-03	9.70E-01	2.10E-02	1.42E-04	0.0473	1.37E-07	4.70E-05	0.083
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		6.14E-03	6.50E-01	2.20E-02	3.92E-04	0.6	3.96E-07	0.0009	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		6.24E-03	2.00E-01	8.90E-03	3.99E-04	0.04	1.63E-07	8.15E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	1.51E-02	1.00E+00	1.00E-02	9.67E-04	0.10	4.44E-07	4.44E-05	0.10
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	0.010	0.010	0.17	0.0019	1.0	0.048	1.19E-04	0.012	2.63E-07	2.63E-05	6.98E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	0.0060	9.00E-04		0.06	0.15	0.016	0.0039	0.7	2.88E-06	0.0032	
Hazard Index										2.6	0.0044	0	
Total Hazard Index =										3			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = if

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

CDI=	$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$			
		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	EPC	b	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4 2E-05	2.0E-01	7.5E-09	1.5E-09		1.1E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.2E-04	5.6E-02	2.1E-08	1.2E-09		3.3E-08	
ug/m3	CARBON TETRACHLORIDE	B2	4 3E-03	5 3E-02	7.7E-07	4.0E-08		1.2E-06	
ug/m3	CHLOROFORM	B2	6 2E-04	8.1E-02	1.1E-07	8.8E-09	0.0E+00	1 7E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.6E-04		1.0E-07		1.0E-02	1.5E-07	1 54E-05
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	2.3E-03	2.0E-03	4.1E-07	8.1E-10	1 7E-01	6.2E-07	3.64E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.4E-03	6.0E-03	2.5E-07	1.5E-09		3.9E-07	

Total ELCR: 5.42E-08

Total HI: 0.00002

704 842

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
Age-specific intake (for carcinogenic compounds only):		
CDI =	CDI_{adj} =	
$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$\frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	EPC	EPC
IR =	N/A	2 a
IR_{adj} =	1.1 b	N/A
EF =	350 a	350 a
ED =	30 a	30 a
BW =	70 a	70 a
AT =	25550 a	10950 a
Dermal:		
Intake for non-carcinogenic compounds:		
Age-specific intake (for carcinogenic compounds only):		
CDI =	CDI_{adj} =	
$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$\frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	EPC	EPC
SA =	N/A	20000 b,c
SA_{adj} =	9480 b,c	N/A
PC =	(Chemical Specific) d	(Chemical Specific) d
ET =	0.007 b,e	0.007 b,e
EF =	350 a	350 a
ED =	30 a	30 a
CF =	1.00E-03	1.00E-03
BW =	70 a	70 a
AT =	25550 a	10950 a

Inhalation.

CDI = Ingestion CDI from above^f

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors"
 OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWA} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWA} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm²-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

704 844

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SF ₀	SF _d	SF _i	EPC	ABSgl	PC	CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation* ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.38E-01	7.00E-01	9.00E-03	2.06E-03	4E-04	1.13E-06	3E-07	4E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.69E-03	8.10E-01	8.40E-03	3.99E-05	2E-06	2.05E-08	1E-09	2E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	3.68E-02	6.50E-01	2.20E-02	5.48E-04	7E-05	7.36E-07	1E-07	3E-05
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	9.18E-01	2.00E-01	8.90E-03	1.36E-02	8E-05	7.42E-06	2E-07	1E-03
MG/L	dis-1,2-DICHLOROETHYLENE	D				9.23E-03	1.00E+00	1.00E-02	1.37E-04		8.39E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	6.41E-03	1.00E+00	4.80E-02	9.54E-05	5E-06	2.80E-07	1E-08	2E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.02E-01	1.50E-01	1.60E-02	3.00E-03	3E-05	2.93E-06	2E-07	2E-05
	Total Risk									6E-04		9E-07	2E-03

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD)

Total Risk = 2E-03

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		1.38E-01	7.00E-01	9.00E-03	3.79E-03	0.063	2.38E-06	5.68E-05					
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.69E-03	8.10E-01	8.40E-03	7.36E-05	0.018	4.33E-08	1.34E-05					
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		3.68E-02	6.50E-01	2.20E-02	1.01E-03	1.4	1.55E-06	0.0034					
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		9.18E-01	2.00E-01	8.90E-03	2.51E-02	2.5	1.57E-05	0.0078					
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	9.23E-03	1.00E+00	1.00E-02	2.53E-04	0.025	1.77E-07	1.77E-05				0.025	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	6.41E-03	1.00E+00	4.80E-02	1.76E-04	0.018	5.90E-07	5.90E-05				0.0010	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		2.02E-01	1.50E-01	1.80E-02	5.52E-03	0.9	6.19E-06	0.007					
Hazard Index										5.0							
										Total Hazard Index =		5					

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	
		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC b
IR =	Inhalation Rate (m ³ /day)	NA	15 a
EF =	Exposure Frequency (days/year)	NA	350 a
ED =	Exposure Duration (years)	NA	6 a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03
BW =	Body Weight (kg)	NA	15 a
AT =	Averaging Time (days)	NA	2190 a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4.2E-05	--	--	--		4.0E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.2E-04	--	--	--		1.2E-07	
ug/m3	CARBON TETRACHLORIDE	B2	4.3E-03	--	--	--		4.1E-06	
ug/m3	CHLOROFORM	B2	6.2E-04	--	--	--	0.0E+00	5.9E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.6E-04	--	--	--	1.0E-02	5.4E-07	5.40E-05
ug/m3	TETRACHLOROETHYLENE (PCE)	C-B2	2.27E-03	--	--	--	1.71E-01	2.18E-06	1.28E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.42E-03	--	--	--		1.36E-06	
Total ELCR:				--	Total HI:			0.0001	

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Dermal:

Intake for non-carcinogenic and carcinogenic compounds:

CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:

CDI = Ingestion CDI from above^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW71) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.38E-01	7.00E-01	9.00E-03	7.57E-04	2E-04	3.13E-07	9E-08	2E-04	2E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	2.69E-02	8.10E-01	8.40E-03	1.47E-05	8E-07	5.67E-09	4E-10	8E-07	8E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	3.68E-02	6.50E-01	2.20E-02	2.02E-04	3E-05	2.04E-07	4E-08	1E-05	1E-05
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	9.18E-01	2.00E-01	8.90E-03	5.03E-03	3E-05	2.05E-06	6E-08	4E-04	4E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				9.23E-03	1.00E+00	1.00E-02	5.06E-05		2.32E-08			
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	6.41E-03	1.00E+00	4.80E-02	3.51E-05	2E-06	7.74E-08	4E-09	7E-08	7E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.02E-01	1.50E-01	1.60E-02	1.10E-03	1E-05	8.11E-07	6E-08	7E-06	7E-06
Total Risk										2E-04	3E-07	8E-04	6E-04	6E-04
										Total Risk =		8E-04		

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	Dermal	Inhalation*
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		1.38E-01	7.00E-01	9.00E-03	8.83E-03	0.15	3.65E-06	8.69E-05	HQ
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		2.69E-03	8.10E-01	8.40E-03	1.72E-04	0.043	6.62E-08	2.04E-05	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		3.68E-02	6.50E-01	2.20E-02	2.35E-03	3.4	2.38E-06	0.0052	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		9.18E-01	2.00E-01	8.90E-03	5.87E-02	5.9	2.40E-05	0.012	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	9.23E-03	1.00E+00	1.00E-02	5.90E-04	0.059	2.71E-07	2.71E-05	0.059
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	6.41E-03	1.00E+00	4.80E-02	4.10E-04	0.041	9.03E-07	9.03E-05	0.0024
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		2.02E-01	1.50E-01	1.60E-02	1.29E-02	2.1	9.47E-06	0.011	
Hazard Index										12	0.028	0	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = if

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

Intake for carcinogenic compounds:

CDI=	$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$			
		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA		20	a
IR =	Inhalation Rate (m ³ /day)	13	a,c	NA	a
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)	350	a	350	a
EF =	Exposure Frequency (days/year)	NA	a	30	a
ED =	Exposure Duration (years)	1 00E-03		1 00E-03	
CF =	Conversion Factor (mg/ug)	NA	a	70	a
BW =	Body Weight (kg)	25550	a	10950	a
AT =	Averaging Time (days)				

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW7677), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	BENZENE	A	5.8E-04	2.7E-02	1.0E-07	2.8E-09	1.7E-03	1.6E-07	9.35E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.0E-03	5.3E-02	5.3E-07	2.8E-08		8.1E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.1E-04	9.1E-02	2.0E-08	1.9E-09	1.4E-03	3.1E-08	2.24E-05
ug/m3	cis-1,2-DICHLOROETHYLENE	D	3.8E-04		6.9E-08		1.0E-02	1.1E-07	1.05E-05
ug/m3	trans-1,2-DICHLOROETHYLENE		8.8E-04		1.6E-07		2.0E-02	2.4E-07	1.21E-05
				Total ELCR: 5.24E-08			Total HI: 0.0016		

Offsite Groundwater (MW76_77) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds.		
CDI = $\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only)	
	CDI _{adj} = $\frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$	
C _{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR _{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds:		
CDI = $\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	Age-specific intake (for carcinogenic compounds only)	
	CDI _{adj} = $\frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$	
C _{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA _{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation:

CDI = Ingestion CDI from above ^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
- b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure
- $$IR_{adj} = \frac{IR_c \times ED_c}{BW_c} + \frac{IR_a \times (ED_a - ED_c)}{BW_a} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$
- 1 09 (L-year)/(kg-day)**
- b = USEPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female adults)
- f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.
- $$SA_{adj} = \frac{SA_c \times ED_c}{BW_c} + \frac{SA_a \times (ED_a - ED_c)}{BW_a} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$
- 9480 (cm²-year)/(kg)**
- d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	CDI	Ingestion ELCR	Dermal CDI	ELCR	Inhalation* ELCR
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.53E-03	9.70E-01	2.10E-02	3.78E-05	2E-06	4.82E-08	3E-09	1E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	1.68E-03	6.50E-01	2.20E-02	2.45E-05	3E-06	3.30E-08	7E-09	1E-06
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	1.60E-03	1.00E+00	5.30E-03	2.38E-05	2E-06	7.71E-09	7E-10	2E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				8.80E-02	1.00E+00	1.00E-02	1.31E-03		8.00E-07		
MG/L	trans-1,2-DICHLOROETHYLENE					2.33E-02	1.00E+00	1.00E-02	3.46E-04		2.11E-07		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.40E+00	7.00E-01	9.00E-03	3.57E-02	7E-03	1.96E-05	6E-06	7E-03
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	5.75E-03	1.00E+00	4.80E-02	8.55E-05	4E-06	2.51E-07	1E-08	2E-07
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	4.75E-03	8.10E-01	8.40E-03	7.08E-05	4E-06	3.63E-08	3E-09	4E-06
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	1.61E+00	1.50E-01	1.60E-02	2.39E-02	3E-04	2.34E-05	2E-06	1E-04
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	2.48E-03	2.00E-01	8.90E-03	3.68E-05	2E-07	2.00E-08	6E-10	3E-06
MG/L	VINYL CHLORIDE	A	7.20E-01	7.20E-01	1.54E-02	1.55E-03	1.00E+00	7.30E-03	2.31E-05	2E-05	1.03E-08	7E-09	4E-07
Total Risk										7E-03		7E-06	7E-03
													1E-02

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = Inhalation intake (CD Total Risk = 1E-02)

Offsite Groundwater (MW76777) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.53E-03	9.70E-01	2.10E-02	6.92E-05	0.023	1.02E-07	3.49E-05	0.041	0.023	1.02E-07	3.49E-05	0.041
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04	1.65E-03	6.50E-01	2.20E-02	4.52E-05	0.065	6.98E-08	1.53E-04	0.0313	0.065	6.98E-08	1.53E-04	0.0313	0.065
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	1.60E-03	1.00E+00	5.30E-03	4.38E-05	1.46E-03	1.63E-08	5.42E-07	1.46E-03	1.63E-08	5.42E-07	0.24	1.63E-08
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	8.80E-02	1.00E+00	1.00E-02	2.41E-03	0.24	1.69E-06	1.69E-04	0.24	1.69E-06	1.69E-04	0.032	1.69E-06
MG/L	trans-1,2-DICHLOROETHYLENE		2.00E-02	2.00E-02	2.00E-02	2.33E-02	1.00E+00	1.00E-02	6.37E-04	0.032	4.48E-07	2.23E-05	0.032	4.48E-07	2.23E-05	0.0010	4.48E-07
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02	2.40E+00	7.00E-01	9.00E-03	6.58E-02	1.1	4.14E-05	0.0010	0.0009	1.1	4.14E-05	0.0010	0.0009	1.1
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	5.75E-03	1.00E+00	4.80E-02	1.58E-04	0.016	5.29E-07	5.29E-05	0.016	5.29E-07	5.29E-05	0.0009	0.016
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03	4.75E-03	8.10E-01	8.40E-03	1.30E-04	0.033	7.65E-08	2.36E-05	0.033	7.65E-08	2.36E-05	0.055	0.033	7.65E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04	1.61E+00	1.50E-01	1.60E-02	4.40E-02	7	4.93E-05	0.055	0.055	7	4.93E-05	0.055	0.007	4.93E-05
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03	2.48E-03	2.00E-01	8.90E-03	6.78E-05	0.007	4.22E-08	2.11E-05	0.007	4.22E-08	2.11E-05	0.007	4.22E-08	2.11E-05
MG/L	VINYL CHLORIDE	A	3.00E-03	3.00E-03	1.10E-01	1.55E-03	1.00E+00	7.30E-03	4.25E-05	0.0142	2.17E-08	7.23E-06	3.86E-04	0.0142	2.17E-08	7.23E-06	3.86E-04
Hazard Index																	
										Total Hazard Index =							
										9							

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		<u>Carcinogenic</u>	<u>Noncarcinogenic</u>	
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC	b
IR =	Inhalation Rate (m ³ /day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW7677), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	BENZENE	A	5.8E-04	--	--	--	1.7E-03	5.6E-07	3.27E-04
ug/m3	CARBON TETRACHLORIDE	B2	3.0E-03	--	--	--		2.8E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.1E-04	--	--	--	1.4E-03	1.1E-07	7.84E-05
ug/m3	cis-1,2-DICHLOROETHYLENE	D	3.8E-04	--	--	--	1.0E-02	3.7E-07	3.69E-05
ug/m3	trans-1,2-DICHLOROETHENE		8.8E-04	--	--	--	2.0E-02	8.5E-07	4.24E-05
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	0	--	--	--		2.9E-08	
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	0	--	--	--	1.7E-01	1.5E-06	8.64E-06
ug/m3	1,1,2-TRICHLOROETHANE	C	8.4E-05	--	--	--		8.1E-08	
ug/m3	TRICHLOROETHYLENE (TCE)	B2	9.7E-04	--	--	--		9.3E-07	
ug/m3	CHLOROFORM	B2	4.4E-04	--	--	--	0.0E+00	4.2E-07	
ug/m3	VINYL CHLORIDE	A	3.7E-03	--	--	--	1.1E-01	3.6E-06	3.27E-05
Total ELCR:						--	Total HI: 0.0005		

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a
Dermal:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation.

CDI = Ingestion CDI from above^f

References:

- a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
- b = US EPA Exposure Factors Handbook, August 1997.
- Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW76/77) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFO	SFD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	ELCR	ELCR
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	2.53E-03	9.70E-01	2.10E-02	1.38E-05	8E-07	1.33E-08	8E-10	4E-07	4E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	1.65E-03	6.50E-01	2.20E-02	9.04E-06	1E-06	9.13E-09	2E-09	5E-07	5E-07
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	1.60E-03	1.00E+00	5.30E-03	8.77E-06	8E-07	2.13E-09	2E-10	8E-07	8E-07
MG/L	cis-1,2-DICHLOROETHYLENE	D				8.80E-02	1.00E+00	1.00E-02	4.82E-04		2.21E-07			
MG/L	trans-1,2-DICHLOROETHYLENE					2.33E-02	1.00E+00	1.00E-02	1.27E-04		5.85E-08			
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	2.40E+00	7.00E-01	9.00E-03	1.32E-02	3E-03	5.43E-06	2E-06	3E-03	3E-03
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	5.75E-03	1.00E+00	4.80E-02	3.15E-05	2E-06	6.94E-08	4E-09	6E-08	6E-08
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5.60E-02	4.75E-03	8.10E-01	8.40E-03	2.60E-05	1E-06	1.00E-08	7E-10	1E-06	1E-06
Total Risk										3E-03	Total Risk =		2E-06	5E-03

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
									CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	2.53E-03	9.70E-01	2.10E-02	1.61E-04	0.054	1.56E-07	5.35E-05	0.09
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		1.65E-03	6.50E-01	2.20E-02	1.05E-04	0.151	1.07E-07	2.34E-04	
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	1.60E-03	1.00E+00	5.30E-03	1.02E-04	3.41E-03	2.49E-08	8.29E-07	0.073
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	8.80E-02	1.00E+00	1.00E-02	5.63E-03	0.56	2.58E-06	2.58E-04	0.56
MG/L	trans-1,2-DICHLOROETHYLENE		2.00E-02	2.00E-02	2.00E-02	2.33E-02	1.00E+00	1.00E-02	1.49E-03	0.07	6.82E-07	3.41E-05	0.07
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2.40E+00	7.00E-01	9.00E-03	1.53E-01	2.6	6.34E-05	0.0015	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	5.75E-03	1.00E+00	4.80E-02	3.68E-04	0.037	8.10E-07	8.10E-05	0.0021
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		4.75E-03	8.10E-01	8.40E-03	3.04E-04	0.08	1.17E-07	3.61E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9.00E-04		1.61E+00	1.50E-01	1.60E-02	1.03E-01	17	7.55E-05	0.08	
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03		2.48E-03	2.00E-01	8.90E-03	1.58E-04	0.016	6.46E-08	3.23E-05	
MG/L	VINYL CHLORIDE	A	3.00E-03	3.00E-03	1.10E-01	1.55E-03	1.00E+00	7.30E-03	9.91E-05	0.0330	3.32E-08	1.11E-05	9.01E-04
Hazard Index										21	0.09	22	0.8

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index; * = inhalation intake (CDI) = if

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

Intake for carcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

$$\frac{C_{air} * IR_{adj} * EF * CF}{AT}$$

C_{air} =	Estimated Indoor Air Concentration (ug/m ³)
IR =	Inhalation Rate (m ³ /day)
IR_{adj} =	Adjusted Inhalation Rate (m ³ -yr)/(kg-day)
EF =	Exposure Frequency (days/year)
ED =	Exposure Duration (years)
CF =	Conversion Factor (mg/ug)
BW =	Body Weight (kg)
AT =	Averaging Time (days)

Carcinogenic		Noncarcinogenic	
EPC	b	EPC	b
NA		20	a
13	a,c	NA	
350	a	350	a
NA	a	30	a
1 00E-03		1 00E-03	
NA	a	70	a
25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
 Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	3.2E-03	1.8E-01	5.7E-07	1.0E-07		8.8E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.2E-04	9.1E-02	2.2E-08	2.0E-09	1.4E-03	3.3E-08	2.37E-05
ug/m3	BENZENE	A	6.2E-04	2.7E-02	1.1E-07	3.0E-09	1.7E-03	1.7E-07	9.95E-05
ug/m3	CHLOROFORM	B2	4.7E-04	8.1E-02	8.3E-08	6.7E-09	0.0E+00	1.3E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.1E-04		7.3E-08		1.0E-02	1.1E-07	1.13E-05
ug/m3	TETRACHLOROETHYLENE(PCF)	C-B2	1.65E-03	2.00E-03	2.93E-07	5.86E-10	1.71E-01	4.5E-07	2.64E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.04E-03	6.00E-03	1.85E-07	1.11E-09		2.8E-07	
Total ELCR:				1.13E-07			Total HI: 0.0001		

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic compounds		
CDI =	Age-specific intake (for carcinogenic compounds only)	
	$\frac{C_{gw} \cdot IR \cdot EF \cdot ED}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot EF \cdot CF \cdot IR_{adj}}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	N/A
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a
Dermal:		
Intake for non-carcinogenic compounds		
CDI =	Age-specific intake (for carcinogenic compounds only):	
	$\frac{C_{gw} \cdot SA \cdot PC \cdot ET \cdot EF \cdot ED \cdot CF}{BW \cdot AT}$	$CDI_{adj} = \frac{C_{gw} \cdot SA_{adj} \cdot PC \cdot ET \cdot EF \cdot CF}{AT}$
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	N/A
SA_{adj} =	Age-adjusted Surface Area (cm ² -yr/kg)	9480 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	30 a
CF =	Conversion Factor (L/cm ³)	1 00E-03
BW =	Body Weight (kg)	70 a
AT =	Averaging Time (days)	25550 a
		10950 a

Inhalation:

CDI = Ingestion CDI from above ^f

References:

- a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.
- $$IR_{adj} = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWA} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$
- 1.09 (L-year)/(kg-day)**
- b = USEPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female adults)
- f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.
- $$SA_{adj} = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWA} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$
- 9480 (cm²-year)/(kg)**
- d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
- f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS, Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SfO	SfD	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*
									CDI	ELCR	CDI	ELCR	
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	1.45E-03	9.70E-01	2.10E-02	2.16E-05	1E-06	2.77E-08	2E-09	6E-07
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	5.18E-04	1.00E+00	5.30E-03	7.70E-06	7E-07	2.49E-09	2E-10	7E-07
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	4.10E-02	1.00E+00	1.60E-02	6.10E-04	4E-04	5.96E-07	4E-07	1E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				2.01E-03	1.00E+00	1.00E-02	2.99E-05		1.82E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	2.53E-02	1.00E+00	4.80E-02	3.76E-04	2E-05	1.10E-06	6E-08	8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.10E-02	1.50E-01	1.60E-02	3.12E-04	3E-06	3.05E-07	2E-08	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	1.01E-03	2.00E-01	8.90E-03	1.49E-05	9E-08	8.13E-09	2E-10	1E-06
	Total Risk								4E-04		4E-07	5E-04	1E-04

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = Inhalation intake (CD)

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	CDI	Ingestion	CDI	HQ	Dermal	CDI	HQ	Inhalation*	HQ
MG/L	BENZENE	A	3.00E-03	2.91E-03	1.70E-03	1.45E-03	9.70E-01	2.10E-02	3.97E-05	0.013	5.84E-08	2.01E-05	0.023	0.010	0.010	0.010	0.010
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3.00E-02	1.40E-03	5.18E-04	1.00E+00	5.30E-03	1.42E-05	4.73E-04	5.26E-09	1.75E-07	0.010	0.010	0.010	0.010	0.010
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9.00E-03	1.00E-02	4.10E-02	1.00E+00	1.60E-02	1.12E-03	0.12	1.26E-06	1.40E-04	0.006	0.006	0.006	0.006	0.006
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1.00E-02	2.01E-03	1.00E+00	1.00E-02	5.50E-05	0.006	3.85E-08	3.85E-06	0.0041	0.0041	0.0041	0.0041	0.0041
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1.00E-02	1.00E-02	1.71E-01	2.53E-02	1.00E+00	4.80E-02	6.93E-04	0.069	2.33E-06	2.33E-04	0.0041	0.0041	0.0041	0.0041	0.0041
MG/L	TRICHLOROETHYLENE (TOE)	B2	6.00E-03	9.00E-04	1.00E-02	2.10E-02	1.50E-01	1.60E-02	5.75E-04	0.10	6.44E-07	7.16E-04	0.0041	0.0041	0.0041	0.0041	0.0041
MG/L	CHLOROFORM	B2	1.00E-02	2.00E-03	1.01E-03	2.00E-03	2.00E-01	8.90E-03	2.75E-05	0.0028	1.72E-08	8.58E-06	0.0011	0.0011	0.0011	0.0011	0.0011
Hazard Index																	
										Total Hazard Index =		0.4					

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = Ir

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds.

CDI=		$\frac{C_{air} * IR * EF * ED * CF}{BW * AT}$	
		Carcinogenic	Noncarcinogenic
C_{air} =	Estimated Indoor Air Concentration (ug/m ³)	NA	EPC b
IR =	Inhalation Rate (m ³ /day)	NA	15 a
EF =	Exposure Frequency (days/year)	NA	350 a
ED =	Exposure Duration (years)	NA	6 a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03
BW =	Body Weight (kg)	NA	15 a
AT =	Averaging Time (days)	NA	2190 a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFI	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	3.2E-03	--	--	--		3.07E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.2E-04	--	--	--	1.40E-03	1.16E-07	8.31E-05
ug/m3	BENZENE	A	6.2E-04	--	--	--	1.70E-03	5.92E-07	3.48E-04
ug/m3	CHLOROFORM	B2	4.7E-04	--	--	--	0.00E+00	4.48E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.1E-04	--	--	--	1.00E-02	3.94E-07	3.94E-05
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.6E-03	--	--	--	1.71E-01	1.58E-06	9.23E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.0E-03	--	--	--		9.9E-07	
Total ELCR:						--	Total HI: 0.0005		

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

	<u>Carcinogenic</u>	<u>Noncarcinogenic</u>
Ingestion:		
Intake for non-carcinogenic and carcinogenic compounds:		
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
IR =	Ingestion Rate (L/day)	1 a
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Dermal:

Intake for non-carcinogenic and carcinogenic compounds:

CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC
SA =	Surface Area (cm ²)	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a
ED =	Exposure Duration (year)	6 a
CF =	Conversion Factor (L/cm ³)	1.00E-03
BW =	Body Weight (kg)	15 a
AT =	Averaging Time (days)	25550 a

Inhalation:CDI = Ingestion CDI from above^f**References:**

- a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b = US EPA Exposure Factors Handbook, August 1997
- c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
- d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
- e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
- f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW79) (Potable Use) - Future Residential Child Carcinogenic Scenario (Optional)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgl	PC	Ingestion		Dermal		Inhalation*	
									CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/L	BENZENE	A	5.50E-02	5.67E-02	2.70E-02	1.45E-03	9.70E-01	2.10E-02	7.95E-06	4E-07	7.66E-09	4E-10	2E-07	2E-07
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	5.18E-04	1.00E+00	5.30E-03	2.84E-06	3E-07	6.90E-10	6E-11	3E-07	3E-07
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	4.10E-02	1.00E+00	1.60E-02	2.25E-04	1E-04	1.65E-07	1E-07	4E-05	4E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				2.01E-03	1.00E+00	1.00E-02	1.10E-05		5.05E-09			
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	2.53E-02	1.00E+00	4.80E-02	1.39E-04	7E-06	3.05E-07	2E-08	3E-07	3E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	2.10E-02	1.50E-01	1.60E-02	1.15E-04	1E-06	8.45E-08	6E-09	7E-07	7E-07
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8.05E-02	1.01E-03	2.00E-01	8.90E-03	5.51E-06	3E-08	2.25E-09	7E-11	4E-07	4E-07
Total Risk										1E-04	Total Risk =		1E-07	4E-05
													2E-04	

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgl	PC	Ingestion			Dermal			Inhalation*	
									CDI	HQ	HQ	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	1 45E-03	9 70E-01	2 10E-02	9 27E-05	0 031	8 93E-08	3 07E-05	0 05			
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 18E-04	1 00E+00	5 30E-03	3 31E-05	0 0011	8 05E-09	2 86E-07	0 024			
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		4 10E-02	1 00E+00	1 60E-02	2 62E-03	0 29	1 92E-06	2 14E-04				
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	2 01E-03	1 00E+00	1 00E-02	1 28E-04	0 013	5 89E-08	5 89E-06	0 013			
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-02	1 00E+00	4 80E-02	1 62E-03	0 16	3 56E-06	3 56E-04	0 009			
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 10E-02	1 50E-01	1 60E-02	1 34E-03	0 22	9 86E-07	0 0011				
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 01E-03	2 00E-01	8 90E-03	6 42E-05	0 006	2 82E-08	1 31E-07				
	Hazard Index									0 73		0 0037	0 4			

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Appendix G-6

Appendix G-6
 Depth-to-Water and Soil Type Classifications Input for Johnson-Ettinger Indoor Air Modeling of Groundwater
 Dunn Field RI

Well	Loc	DTW (ft bgs)	Soil Stratum A Thickness (ft)	Soil Stratum A SCS type	Soil Stratum B Thickness (ft)	Soil Stratum B SCS type	Soil Stratum C Thickness (ft)	Soil Stratum C SCS type
MW-06	Onsite	62	NA	NA	NA	NA	NA	NA
MW-12 (NW Plume)	Onsite	77	38.5	C	0		39	S
MW-30	Offsite	47	16	SI	4	SC	27	S
MW-31	Offsite	68	30	C	5	SC	33	S
MW-32	Offsite	64	25	SI	2	SC	37	S
MW-33	Offsite	53	20	SIC	5	SC	28	S
MW-35	Onsite	77	38.5	C	0	NA	39	S
MW-37	Offsite	135	25	SI	2	SC	108	S
MW-40	Offsite	92	8	SC	9	SIC	75	S
MW-42	Offsite	56	25	SI	6	SC	25	S
MW-44	Offsite	56	19	SI	5	SC	32	S
MW-51	Offsite	45	18	SI	18	SC	9	S
MW-54	Offsite	82	28	SI	10	SC	44	S
MW-67	Offsite	124	15	C	51	S	44	SIC
MW-71	Offsite	67	25	SI	0	NA	44	S
MW-74	Onsite	79	31	SI	12	SC	36	S
MW-75	Onsite	80	31	SI	12	SC	37	S
MW-76	Offsite	86	33	SI	8	SL	45	S
MW-77	Offsite	82	32	SI	10	SC	40	S
MW-78 (N Plume)	Offsite	50	22	SI	2	SL	26	S
MW-79	Offsite	73	25	SI	10	SL	38	S
MW-80	Offsite	62	30	SI	1	SC	31	S
MW-15 (SW Plume)	Onsite	68	23	SI	10	SC	35	S

Soil Classification:

C Clay
 CL Clay Loam
 L Loam
 LS Loamy Sand
 S Sand
 SC Sandy Clay
 SCL Sandy Clay Loam
 SI Silt
 SIC Silty Clay
 SICL Silty Clay Loam
 SIL Silt Loam
 SL Sandy Loam

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.80E-02	8.80E-06	3.05E-02	25	7.127	349.90	556.80	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative air permeability, k_{rp} (cm^2)														
Stratum A effective vapor permeability, k_v (cm^2)														
Thickness of capillary zone, L_c (cm)														
Total porosity in capillary zone, n_{cz} (cm^3/cm^3)														
Air-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)														
Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)														
Floor-wall seam perimeter, X_{crack} (cm)														

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	5.46E-04	7.93E-04	2057.64
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{ts} (unitless)														
Vapor viscosity at ave. soil temperature, μ_{ts} (g/cm-s)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)														
Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)														
Capillary zone effective diffusion coefficient, D_{eff}^c (cm^2/s)														
Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)														
Diffusion path length, L_d (cm)														

Convection path length, L_p (cm)	15	8.53E+02	0.10	5.70E-01	3.16E-03	3.84E+02	1.15E+03	3.89E-06	3.32E-03	1.5E-05	NA			
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg., Q_{vap} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm^2/s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹														
Reference conc., RfC (mg/m ³)														

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
4.88E+01	NA	4.88E+01	7.93E+05	4.88E+01

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_r (cm ³ /cm ³)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.68	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.95	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ² /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _a (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DOT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51265	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(g)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-02	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.58E-03	25	353.24	563.18	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	986.20	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	2.10E-05	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72948	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	278.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	2.19E-02	25	258.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	313.00	510.00	6,391	0.0E+00	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	7,000	1.8E-05	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	686.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	5.0E-01
75274	Bromodichloromethane	5.00E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	5.81E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	578.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.25E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.19E-01	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.73E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03							

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	890 45	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 49E+00	6 26E-07	1 53E-08	12,666	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	13,977	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	10,206	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	813 20	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	12,000	1 3E-04	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	10,373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	8 30E-06	1 78E+02	2 13E-01	5 20E-03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-06	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	3 88E+02	2 91E-02	9 46E-06	2 20E+04	1 80E-02	3 90E-04	9,700	0 0E+00	1 8E-01
95578 2-Chlorophenol	1 60E+03	2 01E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	3 63E+02	7 50E-02	7 80E-06	1 68E+02	3 23E-01	7 88E-03	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	8,501	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	8,525	0 0E+00	7 0E+00
106423 p-Xylene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 86E-02	2 43E-03	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	7,843	2 8E-05	0 0E+00
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	8,523	0 0E+00	7 0E+00
108383 m-Xylene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	7,930	0 0E+00	4 0E-01
108883 Toluene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	7 18E-03	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	9,000	3 3E-04	0 0E+00
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 15E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	0 0E+00	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	10,471	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	3 47E+06	1 90E-02	5 66E-06	6 30E+03	3 85E-01	9 39E-03	6,717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 20E-05	6 56E-05	1 60E-06	1078 24	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	15,000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	905 00	2 1E-05	0 0E+00
218018 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	9 48E-05	1019 70	2 1E-05	0 0E+00
309002 Aldrin	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 48E-05	16,455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 55E-03	1 70E-04	13,000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	6 92E+01	3 27E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E-03	3 06E-05	7 46E-07	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 23E-05	2 25E-06	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	1750 00	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 43E-06	4 20E-01	1 19E-02	2 90E-04	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

79016 21

Trichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, (Enter value or 0) h_a (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_b (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225.04	762	304.8	1158.24	C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, θ_s^A (cm^3/cm^3)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, θ_s^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, θ_s^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	9.46E+08	2210.04	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)														
Stratum A intrinsic permeability, k_i (cm ²)														
Stratum A relative air permeability, k_{ra} (cm ²)														
Stratum A 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)														
Bldg ventilation rate, Q_{bldg} (cm ³ /s)														
Area of enclosed space below grade, A_g (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_{rs} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)														
Stratum C effective diffusion coefficient, D^{eff}_C (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)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} (μg/m ³)														
Average vapor flow rate into bldg, Q_{avg} (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation Péclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{bldg,inf}$ (μg/m ³)														
Unit risk factor, URF (μg/m ³) ⁻¹														
Reference conc., RfC (mg/m ³)														
15	2.78E+02	0.10	6.67E-01	3.20E-03	3.39E+03	3.73E-06	1.04E-03	1.7E-06	NA					

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.38E+03	NA	1.38E+03	1.10E+06	1.38E+03

INCREMENTAL RISK CALCULATIONS.

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

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	B_s (cm ³ /cm ³)	B_t (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.28	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
50293	DOT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E+03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.80E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.66E-03	25	390.88	563.05	10,346	8.3E-06	0.0E+00
71432	Benzene	5.85E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	8.80E-06	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	371.15	586.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDE	1.00E+06	1.69E-02	4.76E-06	9.00E-02	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	2.19E-02	5.34E-04	25	422.35	696.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.42E-05	5.06E+05	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	848.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	745.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 89E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	3 37E+04	5 61E-02	3 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
87965 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 681	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 80	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 40E-04	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	3 44E-06	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 60E-02	8 00E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	561 00	7 643	2 6E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	8 70E-06	1 61E+02	3 01E-01	7 34E-03	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 98E-07	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 88E-07	659 79	9 000	3 3E-04	0 0E+00
11444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	842 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	906 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	825 00	14 447	4 6E-04	0 0E+00
117940 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	773 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14 370	0 0E+00	1 1E-01
156892 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16 455	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-03	3 88E-03	9 46E-05	979 00	16 455	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 28E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	3 27E-02	7 26E-06	1 27E-06	3 08E-05	7 46E-07	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 55E-06	2 55E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	4 67E-01	1 14E-02	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	530 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 58E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19 000	1 0E-04	0 0E+00
12874112 Aroclor 1016 (PCB-1016)	3 30E+04	2 25E-02	5 42E-06	4 20E-01	2 80E-04	2 80E-04	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 12
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)
 C_w
($\mu\text{g/L}$)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

127184 253

Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225.04	762	304.8	1158.24		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{encl} (cm)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.48E+08	2210.04	0.230	0.150	0.130	0.419	9.38E-10	0.746	6.88E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{fa} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative permeability, k_{ra} (cm^2)														
Stratum A soil effective permeability, k_e (cm^2)														
Thickness of capillary zone, L_{ca} (cm)														
Total porosity in capillary zone, n_{ca} (cm^3/cm^3)														
Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)														
Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)														
Floor-wall seam perimeter, X_{crack} (cm)														
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)														
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H_{TS} (atm-m ³ /mol)														
Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)														
Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg, Q_{air} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-y}^{-1}$)														
Reference conc., RfC (mg/m ³)														
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	3.49E-06	1.65E-03	5.8E-07	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
2.55E+03	NA	2.55E+03	2.00E+05	2.55E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Sol Type	K_p (cm ³ /h)	α (1/cm)	N (unitless)	M (unitless)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Mean Grain Diameter (cm)	θ_s (cm ³ /cm ³)	θ_t (cm ³ /cm ³)	0.083	0.38	0.068	0.082
C	0.20	0.008	1.09	0.083	0.38	0.068	0.082									
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016									
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020									
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040									
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044									
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025									
SCL	1.31	0.059	1.48	0.324	0.39	0.034	0.029									
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046									
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039									
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0058									
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011									
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030									

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-06	8.00E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.88E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65550	Benzoic Acid	6.00E-01	5.38E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	985.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	0.10E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	2.19E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E+00	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	368.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,966	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.68E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 39E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25 613 15	798 67	14 751	0 0E+00	3 9E+01
85687 Butyl benzyl phthalate	7 55E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25 660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25 632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25 570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25 627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25 486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25 582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25 519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25 491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25 560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	2 13E-01	5 20E-03	25 417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	1 56E+02	7 79E-02	1 20E-06	25 464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	2 80E+04	4 92E-05	1 90E-03	25 453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25 47 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,6-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25 526 15	759 13	13 000	0 0E+00	3 9E-01
98953 Nitrobenzene	8 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25 483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25 409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25 418 31	636 00	8 737	0 0E+00	1 0E+00
105879 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25 484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26 411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	25 427 21	684 75	11 689	0 0E+00	8 0E-01
106478 p-Chloroaniline	1 74E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25 503 65	754 00	7 800	0 0E+00	2 0E-01
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25 365 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	4 07E+02	7 00E-02	9 20E-06	2 00E+04	5 12E-04	7 34E-03	25 412 27	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25 393 78	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25 404 87	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25 455 02	694 20	10 920	0 0E+00	2 1E+00
108952 Phenol	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25 451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	25 674 43	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	1 51E+07	3 51E-02	3 66E-06	3 40E+01	4 18E-06	1 02E-07	25 687 15	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E+02	2 74E-03	6 68E-05	25 704 09	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25 582 55	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	2 95E+04	3 24E-02	7 74E-06	4 34E+02	2 67E-02	6 51E-05	25 615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	25 486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25 482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25 590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25 416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25 394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25 687 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25 333 65	544 00	7 192	0 0E+00	3 9E-02
156505 trans-1,2-Dichloroethylene	5 23E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25 320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 60E-06	25 809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 58E-03	1 11E-04	25 715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25 655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 48E-02	5 56E-06	8 00E+04	3 40E-05	8 29E-07	25 753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	9 46E-05	25 714 15	979 00	13 000	4 9E-03	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 36E-04	1 70E-04	25 603 01	839 37	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 06E-05	25 596 55	839 36	13 000	1 8E-03	0 0E+00
319897 beta-HCH (beta-BHC)	5 47E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	7 44E-07	25 596 55	839 36	13 000	3 5E-04	0 0E+00
542756 1,3-Dichloropropene	6 02E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	1 77E-02	25 587 38	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	5 45E+02	5 45E-02	8 17E-06	9 89E+03	2 55E-06	7 46E-07	25 558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	25 509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	7 43E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25 613 96	848 76	13 000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25 629 88	1750 00	14 127	0 0E+00	3 0E-04
1109825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	25 657 15	873 31	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25 402 50	539 37	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25 377 50	512 27	19 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)		2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25 345 50	475 22	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

156592

2 0075

Chemical

cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm) (Enter value or 0)	ENTER Thickness of soil stratum C, h_C (cm) (Enter value or 0)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm^2)
16	15	2225 04	762	304 8	1158 24	C	S	SI

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{ow} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
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

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.48E+08	2210.04	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{fa} (cm ³ /cm ³)														
Stratum A intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{rg} (cm ²)														
Stratum A 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)														
Bldg ventilation rate, Q_{ventg} (cm ³ /s)														
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H_{Ts} (atm-m ³ /mol)														
Vapor viscosity at ave soil temperature, μ_{Ts} (g/cm-s)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)														
Stratum C effective diffusion coefficient, D_{eff}^C (cm ² /s)														
Total overall effective diffusion coefficient, $D_{eff,T}$ (cm ² /s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} (ug/m ³)														
Average vapor flow rate into bldg, $Q_{v,bldg}$ (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation, α (unitless)														
Peclet number, $exp(Pe)$ (unitless)														
Area of crack, A_{crack} (cm ²)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., C_{bldg} (ug/m ³)														
Unit risk factor, URF (ug/m ³) ⁻¹														
Reference conc., RIC (mg/m ³)														
15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	3.59E-06	4.11E-04	NA	3.5E-02	5.24E-04	6.93E-04	2210.04	

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
NA	8.88E+04	8.88E+04	3.50E+06	8.88E+04

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_l (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.085	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H^* (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc, R_{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(e)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	3.98E+01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	1.78E+03	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	3.98E+01	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	562.16	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.86E-03	25	353.24	545.00	7,342	8.3E-06	0.0E+00
71536	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E-02	3.02E-02	25	422.35	696.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	330.55	585.85	7,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.58E-02	1.60E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

LOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-06	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14 751	0 0E+00	3 8E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 28E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627 87	799 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14 000	3 4E+00	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+03	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	453 57	705 00	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	447 21	697 60	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	528 15	759 13	13 000	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	2 91E+02	7 03E-06	7 03E-06	1 20E+03	1 78E-04	2 40E-05	483 95	719 00	10 566	0 0E+00	2 0E+03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	4 34E-06	528 15	759 13	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	8 00E-06	3 10E+02	3 23E-01	7 88E-03	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E-02	7 10E-02	8 00E-06	7 87E+03	1 13E-01	2 76E-03	418 31	636 00	11 329	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	8 737	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	447 21	694 75	9 271	0 0E+00	8 0E+01
108478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	503 65	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	355 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-05	674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	704 09	862 22	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+02	5 41E-02	1 32E-03	582 55	825 00	15 000	0 0E+00	7 0E+02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E+02	2 67E-03	6 51E-05	815 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	10 471	0 0E+00	2 0E+01
121142 2,4-Dinitrotoluene	9 55E+01	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	590 00	814 00	11 000	0 0E+00	1 1E+02
124481 Chlorodibromomethane	6 31E+01	1 96E-02	7 06E-06	2 70E+02	3 80E-08	3 21E-02	678 20	800 00	13 467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	7 83E-04	416 14	620 20	8 288	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	667 95	936 00	14 370	0 0E+00	1 1E+01
156582 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	333 65	544 00	7 192	0 0E+00	3 8E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	320 85	518 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 66E-06	1 50E+03	4 55E-03	1 11E-04	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	753 15	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 66E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	1078 24	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	9 46E-05	9 46E-05	714 15	978 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	595 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	595 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381 15	537 38	7 000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	558 00	770 00	12 838	1 9E-04	0 0E+00
621647 N-Nitrosodip-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	628 88	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 34E-06	8 00E-02	1 89E-01	2 00E-03	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	345 50	482 20	18 000	1 0E-04	0 0E+00

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., R(C) (mg/m^3)
9.00E-02	1.04E-05	2.61E-02	25	6.247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9 48E+08	2210 04	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{fa} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative permeability, k_{ra} (cm^2)														
Stratum A effective vapor permeability, k_v (cm^2)														
Thickness of capillary zone, L_{ca} (cm)														
Total porosity in capillary zone, n_{ca} (cm^3/cm^3)														
Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)														
Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)														
Floor-wall seam perimeter, X_{seam} (cm)														
Bldg ventilation rate, $Q_{vent,vg}$ (cm^3/s)														
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)														
Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)														
Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Crack radius, r_{crack} (cm)														
Average vapor flow rate into bldg, Q_{vld} (cm^3/s)														
Crack effective diffusion coefficient, D^{crack} (cm^2/s)														
Area of crack, A_{crack} (cm^2)														
Exponent of equivalent foundation packet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., C_{bldg} ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹														
Reference conc., R/C (mg/m ³)														
15	7 88E+02	0 10	6 67E-01	3 65E-03	3 84E+02	1 26E+03	4 06E-06	3 20E-03	5 0E-05	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.52E+01	NA	1.52E+01	2.25E+06	1.52E+01

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

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)	0.0092	
C	0.20	0.008	1.09	0.083	0.38	0.068			
CL	0.26	0.019	1.31	0.237	0.41	0.095			
L	1.04	0.036	1.56	0.359	0.43	0.078			
LS	14.59	0.124	2.28	0.561	0.41	0.057			
S	29.70	0.145	2.68	0.627	0.43	0.045			
SC	0.12	0.027	1.23	0.187	0.38	0.100			
SCL	1.31	0.059	1.48	0.324	0.39	0.100			
SI	0.25	0.016	1.37	0.270	0.46	0.034			
SIC	0.02	0.005	1.09	0.083	0.26	0.070			
SICL	0.07	0.010	1.23	0.187	0.43	0.089			
SIL	0.45	0.020	1.41	0.291	0.45	0.087			
SL	4.42	0.075	1.89	0.471	0.41	0.065			

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,s} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	9.30E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	8.80E-06	7.40E+04	3.61E-04	5.66E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	5.88E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.58E-02	4.48E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	487.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	696.00	9,479	1.0E-06	0.0E+00
75252	Bromofom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.61E-03	25	330.55	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	9.12E-04	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	386.15	644.00	8,322	1.7E-06	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	681.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03							

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E+02	7 86E+06	1 12E+01	3 85E+08	9 39E-10	798 67	14 751	0 0E+00	3 9E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E+02	4 83E+06	2 69E+00	5 17E+05	1 28E-06	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E+02	6 35E+06	3 51E+01	2 05E+04	5 00E+06	890 45	13 000	1 4E+06	0 0E+00
86737 Fluorene	1 38E+04	3 63E+02	7 88E+06	1 98E+00	2 61E+03	6 37E+05	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E+02	7 03E+06	7 48E+00	6 26E+07	1 53E+08	899 00	13 977	5 7E+06	0 0E+00
87693 Hexachloro-1,3-butadiene	5 37E+04	6 16E+02	6 16E+06	3 34E+01	3 34E+01	8 15E+03	738 00	10 206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E+02	6 10E+06	1 95E+03	1 00E+06	2 44E+08	813 20	14 000	3 4E+05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E+02	6 25E+06	8 00E+02	3 19E+04	7 78E+06	749 03	12 000	3 1E+06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E+02	7 50E+06	3 10E+01	1 98E+02	4 83E+04	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E+02	6 74E+06	3 11E+00	1 64E+07	4 00E+09	754 03	13 000	1 3E+04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E+02	1 00E+05	1 78E+02	2 13E+01	5 20E+03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E+02	8 30E+06	2 60E+04	4 92E+05	1 20E+06	597 60	10 800	1 8E+01	0 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E+02	7 80E+06	1 56E+02	7 79E+02	1 90E+03	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E+02	9 46E+06	2 20E+04	1 60E+02	3 90E+04	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E+02	7 03E+06	1 20E+03	1 78E+04	4 34E+06	759 13	13 000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E+02	8 60E+06	2 09E+03	9 84E+04	2 40E+05	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E+02	7 80E+06	1 69E+02	7 88E+03	2 80E+06	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E+02	8 00E+06	3 10E+02	1 13E+01	2 78E+03	636 00	11 329	0 0E+00	7 0E+02
105679 2,4-Dimethylphenol	2 09E+02	5 84E+02	8 69E+06	7 87E+03	8 20E+05	2 00E+06	707 60	8 737	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E+02	8 44E+06	1 85E+02	3 14E+01	7 66E+03	684 75	9 271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	7 38E+01	9 98E+02	2 43E+03	616 20	8 525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E+02	1 01E+05	5 30E+03	1 38E+05	3 32E+07	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E+01	9 90E+06	8 52E+03	4 01E+02	9 78E+04	561 00	7 643	2 6E+05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E+02	9 20E+06	2 00E+04	2 10E+02	5 12E+04	619 05	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E+02	7 80E+06	1 61E+02	7 34E+03	2 00E+05	517 13	7 930	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E+02	8 60E+06	5 26E+02	2 72E+01	6 63E+03	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E+02	8 70E+06	8 28E+04	1 52E+01	3 71E+03	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E+02	9 10E+06	1 63E+05	2 55E+02	3 98E+07	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E+02	7 53E+06	1 72E+04	7 38E+04	1 80E+05	659 79	9 000	3 3E+04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E+02	4 55E+06	5 10E+01	4 59E+04	1 12E+05	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E+02	3 66E+06	3 40E+01	4 18E+06	1 02E+07	806 00	15 999	4 0E+06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E+02	3 58E+06	2 00E+02	2 74E+03	6 68E+05	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E+02	5 91E+06	6 20E+00	5 41E+02	1 32E+03	825 00	14 447	4 6E+04	0 0E+00
120127 Anthracene	2 95E+04	3 24E+02	7 74E+06	4 34E+02	2 67E+03	6 51E+05	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E+02	8 23E+06	3 00E+02	5 82E+02	1 42E+03	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E+02	8 77E+06	4 50E+03	1 30E+04	3 17E+06	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E+01	7 06E+06	2 70E+02	3 80E+06	9 27E+08	814 00	13 467	1 9E+04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E+02	1 05E+05	2 60E+03	3 21E+02	7 83E+04	678 20	8 000	2 4E+05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E+02	8 20E+06	2 00E+02	7 54E+01	1 84E+02	620 20	8 288	5 8E+07	0 0E+00
129000 Pyrene	1 05E+05	2 72E+02	7 24E+06	1 35E+01	4 51E+04	1 10E+05	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E+02	1 13E+05	3 50E+03	1 67E+01	4 07E+03	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E+02	1 19E+05	6 30E+03	3 85E+01	9 39E+03	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E+02	5 66E+06	2 20E+05	6 58E+05	1 60E+06	1078 24	17 000	2 1E+04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E+02	5 56E+06	1 50E+03	4 53E+03	1 11E+04	969 27	15 000	2 1E+04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E+02	6 35E+06	2 06E+01	6 60E+04	1 61E+05	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E+02	5 56E+06	8 00E+04	3 40E+05	8 29E+07	1019 70	16 000	2 1E+05	0 0E+00
218019 Chrysene	3 98E+05	2 48E+02	6 21E+06	1 60E+03	3 88E+03	9 46E+05	979 00	13 000	4 9E+03	0 0E+00
309002 Aldrin	2 45E+06	1 32E+02	4 86E+06	1 80E+01	6 97E+03	1 70E+04	603 01	839 37	13 000	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E+02	7 34E+06	2 00E+00	4 38E+04	1 06E+05	839 36	13 000	1 8E+03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E+02	7 34E+06	2 40E+01	3 05E+05	7 44E+07	587 38	13 000	5 3E+04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E+02	1 00E+05	2 80E+03	1 77E+02	1 77E+02	770 00	12 938	1 9E+04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E+02	7 26E+06	1 82E+02	3 08E+05	7 46E+07	746 87	11 000	2 0E+03	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E+02	8 17E+06	9 89E+03	9 23E+05	2 25E+06	746 87	13 000	2 6E+03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E+02	4 23E+06	2 00E+01	3 90E+04	9 51E+06	848 76	13 000	0 0E+00	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E+02	6 30E+06	5 62E+02	4 67E+01	1 14E+02	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E+02	4 34E+06	7 40E+01	2 46E+04	6 00E+06	873 31	19 000	3 2E+04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E+02	4 32E+06	8 00E+02	1 89E+01	4 80E+03	539 37	19 000	1 0E+04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E+02	5 00E+06	5 70E+02	8 20E+02	2 00E+03	512 27	19 000	1 0E+04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E+02	5 42E+06	4 20E+01	1 19E+02	2 90E+04	475 22	18 000	1 0E+04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E+02	5 31E+06	3 40E+01	2 13E+02	5 20E+04	482 20	18 000	1 0E+04	0 0E+00

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m^3)
1.04E-01	9.90E-06	9.78E-04	25	7,643	356.65	561.00	1.74E+01	8.52E+03	2.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2210.04	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rp} (cm^2)	Stratum A 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)
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)			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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.16E-04	15	8.457	6.27E-04	2.64E-02	1.77E-04	4.22E-03	1.09E-03	6.67E-04	7.62E-04	1.01E-03	2210.04
Convection path length, L_p (cm)			Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m ³)			
	15	2.64E+01	0.10	6.67E-01	4.22E-03	3.84E+02	4.75E+02	4.59E-06	1.21E-04	2.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
7.71E+02	NA	7.71E+02	8.52E+06	7.71E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_p (cm ³ /h)	α (1/cm)	N (unitless)	M (unitless)	D_a (cm ² /s)	D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R_{fc} (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.085	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R_{fc} (mg/m ³)
50293	DOT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.80E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-02	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-03	1.54E-06	25	329.20	508.10	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	334.32	536.40	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.86E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	330.88	563.05	10,346	0.0E+00	3.5E-01
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.56E-03	25	353.24	562.16	7,342	8.3E-06	1.0E+00
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E-03	2.28E-01	7.51E-06	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.23E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	631.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	2.19E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.04E-05	1.19E+03	2.19E-02	5.34E-04	25	422.35	598.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	598.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	603.69	848.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	7.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Tetrachloroethane	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	681.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 75E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	3 59E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	680 60	839 68	13 000	0 0E+00	7 0E+01
86308 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	788 00	10 206	2 2E-05	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E+01
96953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	447 21	684 75	9 271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-07	25	503 65	754 00	11 689	0 0E+00	1 4E+02
106478 p-Chloroaniline	6 61E+01	4 83E-02	9 90E-06	5 30E+03	1 01E-05	3 32E-07	25	503 65	754 00	7 843	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	7 930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	8 410	0 0E+00	2 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	659 20	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 78	14 000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	25	674 43	942 94	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	808 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	723 00	13 121	0 0E+00	1 1E+01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	775 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+08	2 26E-02	5 56E-06	1 50E+03	4 59E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+08	2 28E-02	5 56E-06	8 00E+04	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+08	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 36E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 28E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	25	381 15	700 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	11 000	2 0E-03	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 88E-03	9 23E-05	2 25E-06	25	509 60	746 87	13 000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	19 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		
Chemical CAS No (numbers only, no dashes)	Initial groundwater conc., C_w ($\mu\text{g/L}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
71432	1.45			Totals must add up to value of L_{wt} (cell D28)		Soil stratum directly above water table, (Enter A, B, or C)		SCS soil type directly above water table		User-defined stratum A soil vapor permeability, k_v (cm^2)		
				Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)						
				ENTER		ENTER		ENTER		ENTER		
				16		15		2225.04		762		
				304.8		1158.24		C		S		

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)			
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3			

ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space length, L_g (cm)	Enclosed space width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
8.80E-02	9.80E-06	5.56E-03	25	7.342	353.24	562.16	5.88E+01	1.75E+03	8.3E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2210.04	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative permeability, k_{rg} (cm^2)														
Stratum A 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)														
Bldg. ventilation rate, Q_{ventg} (cm^3/s)														
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H_{ts} (atm-m ³ /mol)														
Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)														
Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)														
Total overall effective diffusion coefficient, $D_{eff,T}$ (cm^2/s)														
Diffusion path length, L_0 (cm)														
Convection path length, L_p (cm)	15	1.53E+02	0.10	6.67E-01	3.57E-03	3.84E+02	1.47E+03	4.03E-06	6.18E-04	8.3E-06	5.40E-04	6.21E-04	8.22E-04	2210.04
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg, Q_{soil} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm^2/s)														
Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{infinite}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-}1$)														
Reference conc., RfC (mg/m ³)														
NA														

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
4.75E+02	NA	4.75E+02	1.75E+06	4.75E+02

INCREMENTAL RISK CALCULATIONS

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

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	δ_s (cm ³ /cm ³)	δ_l (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0082
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+02	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56563	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-02	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.38	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.86E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.66E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	259.25	432.00	5,714	0.0E+00	5.0E-03
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	276.71	467.00	5,714	0.0E+00	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	422.35	696.00	9,479	0.0E+00	7.0E-01
75092	Methylene chloride	4.57E+01	1.04E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	0.0E+00
75150	Carbon disulfide	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	8,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.03E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	745.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03							

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E+02	7 86E+06	1 12E+01	3 85E+08	9 39E-10	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E+02	4 83E+06	2 69E+00	5 17E+05	1 28E+06	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E+02	6 35E+06	3 51E+01	2 05E+04	5 00E+06	632 28	890 45	13 000	1 4E+06	0 0E+00
86737 Fluorene	1 38E+04	3 63E+02	7 88E+06	1 98E+00	2 61E+03	6 37E+05	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E+02	7 03E+06	7 48E+00	6 26E+07	1 53E+08	627 87	899 00	13 977	5 7E+06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E+02	6 16E+06	3 23E+00	3 34E+01	8 15E+03	486 15	738 00	10 206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E+02	6 10E+06	1 95E+03	1 00E+06	2 44E+08	582 15	813 20	14 000	3 4E+05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E+02	6 25E+06	8 00E+02	3 19E+04	7 78E+06	519 15	749 03	12 000	3 1E+06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E+02	7 50E+06	3 10E+01	1 98E+02	4 83E+04	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E+02	6 74E+06	3 11E+00	1 64E+07	4 00E+09	560 26	754 03	13 000	1 3E+04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E+02	1 00E+05	2 13E+01	1 78E+02	5 20E+03	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E+02	8 30E+06	2 80E+04	4 92E+05	1 20E+06	463 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	1 56E+02	7 79E+02	1 90E+03	25 454	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E+02	9 46E+06	2 20E+04	1 60E+02	3 90E+04	25 447 53	875 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E+02	7 03E+06	1 20E+03	1 78E+04	4 34E+06	25 526 15	759 13	13 000	0 0E+00	3 5E+01
95953 Nitrobenzene	6 46E+01	7 60E+02	8 60E+06	2 09E+03	9 84E+04	2 40E+05	25 483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E+02	7 80E+06	1 69E+02	3 23E+01	7 88E+03	25 409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E+02	8 00E+06	3 10E+02	1 13E+01	2 76E+03	25 418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E+02	8 69E+06	7 87E+03	8 20E+05	2 00E+06	25 484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E+02	8 44E+06	1 85E+02	3 14E+01	7 68E+03	26 411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	7 38E+01	9 96E+02	2 43E+03	25 503 65	754 00	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E+02	1 01E+05	5 30E+03	1 36E+05	3 32E+07	25 447 21	684 75	11 889	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E+01	9 90E+06	8 52E+03	4 01E+02	9 78E+04	25 368 65	561 00	7 843	2 6E+05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E+02	9 20E+06	2 00E+04	2 10E+02	5 12E+04	25 345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E+02	7 80E+06	1 61E+02	3 01E+01	7 34E+03	25 412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E+02	8 60E+06	5 26E+02	2 72E+01	6 63E+03	25 383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E+02	9 10E+06	8 28E+04	1 52E+01	3 71E+03	25 404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E+02	9 10E+06	4 72E+02	1 63E+05	3 98E+07	25 455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E+02	7 53E+06	1 72E+04	7 38E+04	1 80E+05	25 451 15	659 79	9 000	3 3E+04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E+02	4 55E+06	5 10E+01	4 59E+04	1 12E+05	25 674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E+02	3 66E+06	3 40E+01	4 18E+06	1 02E+07	25 657 15	806 00	15 999	4 0E+06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E+02	3 58E+06	2 00E+02	2 74E+03	6 68E+05	25 704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E+02	5 91E+06	6 20E+00	5 41E+02	1 32E+03	25 582 55	825 00	14 447	4 6E+04	0 0E+00
120127 Anthracene	2 95E+04	3 24E+02	7 74E+06	4 34E+02	2 67E+03	6 51E+05	25 615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E+02	8 23E+06	3 00E+02	5 82E+02	1 42E+03	25 486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E+02	8 77E+06	4 50E+03	1 30E+04	3 17E+06	25 482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E+01	7 06E+06	2 70E+02	3 80E+06	9 27E+08	25 590 00	814 00	13 467	1 9E+04	0 0E+00
124481 Chlorobromomethane	6 31E+01	1 96E+02	1 05E+05	2 60E+03	3 21E+02	7 83E+04	25 416 14	678 20	8 000	2 4E+05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E+02	8 20E+06	2 00E+02	7 54E+01	1 84E+02	25 394 40	620 20	8 288	5 8E+07	0 0E+00
129000 Pyrene	1 05E+05	2 72E+02	7 24E+06	1 35E+01	4 51E+04	1 10E+05	25 333 65	544 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E+02	1 13E+05	3 50E+03	1 67E+01	4 07E+03	25 320 85	516 50	6 717	0 0E+00	7 0E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E+02	1 19E+05	6 30E+03	3 85E+01	1 60E+06	25 809 15	1078 24	17 000	2 1E+04	0 0E+00
183395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E+02	5 66E+06	2 20E+05	4 55E+03	1 11E+04	25 715 90	969 27	15 000	2 1E+04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E+02	5 56E+06	1 50E+03	4 55E+03	1 61E+05	25 656 95	905 00	13 815	0 0E+00	1 4E+01
206440 Fluoranthene	1 07E+05	3 02E+02	6 35E+06	2 06E+01	6 60E+04	8 29E+07	25 753 15	1019 70	16 000	2 1E+05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E+02	5 56E+06	8 00E+04	3 40E+05	9 48E+05	25 714 15	979 00	16 455	2 1E+06	0 0E+00
218019 Chrysene	3 98E+05	2 48E+02	6 21E+06	1 60E+03	3 88E+03	1 70E+04	25 603 01	839 37	13 000	4 9E+03	0 0E+00
309002 Aldrin	2 45E+06	1 32E+02	4 86E+06	1 80E+01	6 97E+03	1 08E+05	25 596 55	839 36	13 000	1 8E+03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E+02	7 34E+06	2 40E+01	3 05E+05	7 44E+07	25 589 15	770 00	12 938	1 9E+04	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E+02	1 00E+05	2 80E+03	7 26E+01	2 25E+06	25 509 60	746 87	11 000	2 0E+03	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E+02	7 26E+06	1 82E+02	3 06E+05	9 51E+06	25 613 96	848 76	13 000	2 6E+03	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E+02	8 17E+06	9 99E+03	9 23E+05	2 46E+04	25 629 88	1750 00	14 127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E+02	6 30E+06	5 62E+02	4 67E+01	6 00E+06	25 657 15	873 31	14 000	3 2E+04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E+02	4 34E+06	7 40E+01	2 46E+04	4 60E+06	25 402 50	539 37	19 000	1 0E+04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E+02	4 32E+06	8 00E+02	1 89E+01	4 60E+06	25 377 50	512 27	19 000	1 0E+04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E+02	5 00E+06	5 70E+02	8 20E+02	2 00E+03	25 340 50	475 22	18 000	1 0E+04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E+02	5 42E+06	4 20E+01	1 19E+02	2 90E+04	25 345 50	482 20	18 000	1 0E+04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E+02	5 31E+06	3 40E+01	2 13E+02	5 20E+04					

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., $R(C)$ (mg/m^3)
1.06E-01	1.23E-06	2.71E-02	25	5,250	259.25	432.00	1.86E+01	2.76E+03	8.4E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{we} (cm ³ /cm ³)														
Stratum A soil intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{rp} (cm ²)														
Stratum A 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)														
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)														
Area of enclosed space below grade, A_g (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} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{ts} (unitless)														
Vapor viscosity at ave. soil temperature, μ_{ts} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm ² /s)														
Total overall effective diffusion coefficient, D^{eff}_T (cm ² /s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} (μg/m ³)														
Average vapor flow rate into bldg., Q_{avg} (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{building}$ (μg/m ³)														
Unit risk factor, URF (μg/m ³) ⁻¹														
Reference conc., RfC (mg/m ³)														
15	8.81E+02	0.10	6.67E-01	4.29E-03	3.84E+02	4.28E+02	4.25E-06	3.75E-03	8.4E-05	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
7.73E+00	NA	7.73E+00	2.76E+06	7.73E+00

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
66850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.7E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoforn	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E-04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	3 17E-02	4 83E-06	2 89E+00	5 17E-05	1 28E-06	25	660 60	839 88	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 86E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 686	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+03	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	403 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	358 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	6 86E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 86E-05	25	582 55	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	674 15	806 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	735 00	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 000	2 1E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 80E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	3 5E-02
136592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 86E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 48E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
621647 N-Nitrosod-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER

Initial groundwater conc. C_w ($\mu\text{g/L}$)

Chemical

67663

Chloroform

ENTER

Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)

ENTER

Depth below grade to bottom of enclosed space floor, L_F (cm)

ENTER

Depth below grade to water table, L_{WT} (cm)

ENTER

Thickness of soil stratum A, h_A (cm)

ENTER

Thickness of soil stratum B, h_B (cm)

ENTER

Thickness of soil stratum C, h_C (cm)

ENTER

Soil stratum directly above water table, (Enter A, B, or C)

ENTER

Soil stratum directly above water table, (Enter A, B, or C)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

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Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)

ENTER

Stratum A soil dry bulk density, ρ_s^A (g/cm^3)

ENTER

Stratum A soil water-filled porosity, θ_w^A (unitless)

ENTER

Stratum B soil dry bulk density, ρ_s^B (g/cm^3)

ENTER

Stratum B soil total porosity, n^B (unitless)

ENTER

Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)

ENTER

Stratum C soil dry bulk density, ρ_s^C (g/cm^3)

ENTER

Stratum C soil total porosity, n^C (unitless)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

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Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

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Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

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Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)

ENTER

Enclosed space floor thickness, L_{enc} (cm)

ENTER

Enclosed space floor length, L_b (cm)

ENTER

Enclosed space floor width, W_b (cm)

ENTER

Enclosed space height, H_b (cm)

ENTER

Enclosed space width, W (cm)

ENTER

Enclosed space width, W (cm)

ENTER

Enclosed space width, W (cm)

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Enclosed space width, W (cm)

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Enclosed space width, W (cm)

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Enclosed space width, W (cm)

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Enclosed space width, W (cm)

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Enclosed space width, W (cm)

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Enclosed space width, W (cm)

ENTER

Enclosed space width, W (cm)

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)

ENTER

Target risk for carcinogens, TR (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

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Target hazard quotient for noncarcinogens, THQ (unitless)

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Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

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Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

ENTER

Target hazard quotient for noncarcinogens, THQ (unitless)

70

Used to calculate risk-based groundwater concentration

30

Used to calculate risk-based groundwater concentration

30

Used to calculate risk-based groundwater concentration

350

Used to calculate risk-based groundwater concentration

1.0E-06

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

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Used to calculate risk-based groundwater concentration

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Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RTC (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2545 32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_w (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_c (cm)	Total porosity in capillary zone, n_c (cm^3/cm^3)	Air-filled porosity in capillary zone, θ_a^c (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_w^c (cm^3/cm^3)	Floor-wall seam penmeter, X_{crack} (cm)
Bldg ventilation rate, Q_{vent} (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	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-n ³ /mol)	Henry's law constant at ave. groundwater temperature, H_{TS}^* (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_c (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	8.40E-04	7.36E-04	1.02E-03	2545 32
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)			Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
	15	1.04E+02	0.10	6.67E-01	4.22E-03	3.84E+02	4.80E+02	4.24E-06	4.41E-04	2.3E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
2.40E+02	NA	2.40E+02	7.92E+06	2.40E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-03	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58989	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
2.14E+04	Dieldrin	1.25E-02	4.74E-06	1.95E-01	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
6.00E-01	Benzic Acid	5.36E-02	7.97E-06	6.31E-05	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
65571	Diieldrin	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	320.20	508.10	6,955	0.0E+00	3.5E-01
67641	Acetone	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67663	Chloroform	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
67721	Hexachloroethane	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71363	Butanol	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	363.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,708	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	1.90E-03	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	596.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	8.74E+03	6.58E-02	1.60E-03	25	363.55	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76418	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-02	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84602 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 65E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 9E-01
85687 Butyl benzyl phthalate	5 79E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	660 80	899 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 03E+00	7 48E-07	1 53E-08	25	627 87	799 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	4 92E-05	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	1 56E+02	7 78E-02	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 78E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 9E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11 689	0 0E+00	1 5E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	512 65	519 13	7 800	0 0E+00	2 0E-01
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-08	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 843	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+04	1 52E-01	3 98E-07	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 9E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 38E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 65E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 40E+00	4 35E-04	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E+00	4 35E-04	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	581 15	587 38	7 000	3 7E-05	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

VLOOKUP TABLES

DATA ENTRY SHEET

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

YES ☐ X ☐

OR

YES ☐

VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)
 C_w
($\mu\text{g/L}$)

Chemical

79016 1607 5

Trichloroethylene

ENTER Average soil/ groundwater temperature, T_s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_p (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_A (cm)	ENTER Enclosed space width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RFC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.38	544.20	1.68E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A 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_{seam} (cm)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.16E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	4.82E-04	5.58E-04	7.71E-04	2545.32
Convection path length, L_p (cm)		Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vol} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$)	Reference conc., RfC (mg/m^3)			
	15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	3.50E-06	9.73E-04	1.7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.47E+03	NA	1.47E+03	1.10E+06	1.47E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _a (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ^a (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50283	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.8E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.76E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	13,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.86E+01	1.06E-01	1.23E-05	1.52E+03	2.56E-01	2.71E-02	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.17E+01	1.01E-01	1.17E-05	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	4.57E+01	1.04E-01	1.00E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	8.71E+01	1.49E-02	1.03E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromofom	5.50E+01	2.98E-02	1.08E-05	3.10E+03	2.19E-02	5.34E-04	25	363.15	585.85	7,000	1.5E-05	0.0E+00
75274	Bromodichloromethane	3.16E+01	7.42E-02	1.05E-05	6.74E+03	6.56E-02	1.60E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethene	5.89E+01	9.00E-02	1.04E-05	5.06E+03	2.30E-01	5.61E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.5E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	8.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
79005	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	620.00	8,322	1.6E-05	0.0E+00
79018	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-05	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	1 53E-08	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	3 23E+00	3 34E-01	8 15E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	2 20E+04	1 95E-06	8 15E-08	738 00	10,206	2 2E-05	0 0E+00
87885 Pentachlorophenol	5 92E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	5 90E-02	7 50E-06	3 10E+01	1 98E-02	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	754 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	697 60	10,800	0 0E+00	1 9E-01
95501 1,2-Dichlorobenzene	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	1 60E+03	2 91E-02	7 03E-06	2 09E+03	9 84E-04	2 40E-05	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	6 46E+01	7 60E-02	8 60E-06	1 69E+02	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
96953 Nitrobenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	3 89E+02	6 90E-02	7 90E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E-02
106423 p-Xylene	6 17E+02	4 83E-02	1 01E-05	5 30E+03	1 36E-05	2 43E-07	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 61E+01	4 83E-02	9 90E-06	8 52E+03	4 01E-02	9 78E-04	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	108383 m-Xylene	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	793 00	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	9 80E-05	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E-03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	544 00	7,192	0 0E+00	7 0E-02
156592 ds-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	936 00	14,370	0 0E+00	1 1E-01
156805 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+08	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 10E-06	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 96E-02	5 56E-06	1 50E-03	4 58E-03	1 60E-06	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	3 88E+05	2 48E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 08E-05	7 44E-07	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 28E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 08E-05	7 46E-07	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13,000	2 8E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	11097691 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	8 00E-02	1 89E-01	4 60E-06	539 37	19,000	1 0E-04	0 0E+00
1267412 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
						5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

79005

1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{WT} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1.0E-06

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.38E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $C_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	5.10E-04	5.80E-04	8.07E-04	2545.32

Convection path length, L_p (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 number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RfC (mg/m ³)
15	2.33E+01	0.10	6.67E-01	3.17E-03	3.84E+02	3.68E+03	3.61E-06	8.43E-05	1.6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based Indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.80E+03	NA	1.80E+03	4.42E+06	1.80E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0032
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0086
SIL	0.45	0.020	1.41	0.281	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H ^o (unitless)	Henry's law constant law constant reference temperature, T _R (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{vap} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25.60528	427.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25.74324	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25.34990	556.60	7,127	1.5E-05	0.0E+00
56533	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25.70815	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25.62424	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25.59655	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25.61332	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	1.54E-05	1.54E-06	25.72000	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.89E-03	3.88E-03	25.32920	508.10	6,955	0.0E+00	3.8E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25.33432	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25.45800	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25.39088	563.05	10,346	0.0E+00	3.9E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25.35324	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25.34724	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25.71815	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25.65102	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25.63990	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25.63644	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25.27671	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25.25925	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25.31300	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25.31900	552.00	6,391	7.0E-01	0.0E+00
75232	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25.42235	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25.36315	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25.33055	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25.30475	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25.60369	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25.51215	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25.48835	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25.36952	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25.38615	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.42E-01	1.03E-02	25.36036	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25.41960	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.58E-04	25.55054	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	7 4E-02	4 83E-06	2 69E+00	5 17E+05	1 28E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86308 N-Nitrodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
88737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E+03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87663 Hexachloro-1,3-bisulane	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	9 56E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 9E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	4 4E-01
91941 3,3-Dichlorobenzidine	54776 o-Xylene	7 24E-02	6 74E-06	3 11E+00	1 64E-07	8 30E-04	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95478 o-Xylene	3 63E+02	8 70E-02	9 00E-05	1 78E+02	2 13E-01	4 00E-09	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E+05	1 20E-06	25	484 19	697 60	10 800	0 0E+00	1 8E-01
95501 2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	447 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	526 15	759 13	9 572	0 0E+00	8 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	483 95	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	8 00E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 71E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	365 65	561 00	7 643	2 6E-05	0 0E+00
*07062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-08	2 00E+04	2 10E-02	5 12E-04	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	7 30E-02	8 70E-06	4 72E+02	2 72E-01	6 63E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 59E+01	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
11787 8-Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-08	1 02E-07	25	582 55	862 22	15 999	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	5 12E-02	5 91E-06	2 00E+02	2 74E-03	6 88E-05	25	704 09	862 22	15 000	0 0E+00	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	8 20E+00	5 41E-02	1 32E-03	25	582 55	862 22	15 000	0 0E+00	7 0E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	9 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
*27184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-08	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 87E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156603 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	603 01	839 37	13 000	4 9E-03	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	320 85	516 50	6 717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 07E+05	3 02E-02	6 35E-06	5 0E-03	4 53E-03	1 1E-04	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 06E-01	6 80E-04	1 61E-05	25	715 90	969 27	15 000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 32E-02	6 2E-06	1 60E-03	3 88E-03	9 46E-05	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	3 32E-02	4 86E-08	1 80E-01	6 97E-03	1 70E-04	25	714 15	979 00	16 455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-08	2 00E+00	4 35E-04	1 06E-05	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-08	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	8 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E-02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
627647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	8 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
*1096825 Aroclor 1260 (PCB-1260)	2 00E+05	3 8E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	407 50	539 37	9 000	1 0E-04	0 0E+00
1109769 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53465219 Aroclor 1242 (PCB-1242)	3 30E+04	2 44E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

127184 575

Tetrachloroethylene

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2)
18	15	2560 32	1005 84	274 32	1280 16		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	17	0.42	0.27	17	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RIC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8.288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, $\theta_{s,A}$ (cm^3/cm^3)	Stratum B soil air-filled porosity, $\theta_{s,B}$ (cm^3/cm^3)	Stratum C soil air-filled porosity, $\theta_{s,C}$ (cm^3/cm^3)	Stratum A effective total fluid saturation, $S_{e,A}$ (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rA} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cA} (cm)	Total porosity in capillary zone, n_{tA} (cm^3/cm^3)	Air-filled porosity in capillary zone, θ_{sA} (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_{wA} (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (cm^2/s)	Capillary zone effective diffusion coefficient, $D_{eff,C}$ (cm^2/s)	Total overall effective diffusion coefficient, $D_{eff,T}$ (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	5.05E-04	7.01E-04	2545.32
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	3.27E-06	1.54E-03	5.8E-07	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
2.72E+03	NA	2.72E+03	2.00E+05	2.72E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ^o (unitless)	Henry's law constant at reference temperature, H ^o (unitless)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
66850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	3.00E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.99E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,831	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.68E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E+00	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	2 61E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E+06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+01	3 19E-04	8 15E-07	738 00	10,206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 80E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E+05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E+06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+00	1 98E-02	4 83E-04	754 03	13,000	1 3E+04	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 10E+00	1 64E-07	4 00E-09	748 00	10,373	0 0E+00	1 4E+01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	1 56E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	2 00E+02	7 79E-02	3 90E-04	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E+03
98953 Nitrobenzene	6 46E+01	7 80E-02	8 60E-06	2 09E+03	9 84E-04	7 88E-05	617 20	8,501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	636 00	8,737	0 0E+00	1 0E+00
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	707 60	11,329	0 0E+00	7 0E+02
105679 2,4-Dimethylphenol	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 6E+05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E+01
108907 Chlorobenzene	7 30E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	3 3E+04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	942 94	14,000	0 0E+00	2 1E+02
115787 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E+01	4 18E-06	1 02E-07	806 00	15,999	4 0E+06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 74E-03	2 74E-03	6 68E-05	862 22	15,000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14,447	4 6E+04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E+04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E+05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E+07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E+01	4 51E-04	1 10E-05	394 40	14,370	0 0E+00	1 1E+01
156592 di-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	9 39E-03	516 50	6,717	0 0E+00	7 0E+02
205992 Benzofluoranthene	1 23E+06	2 26E-02	5 66E-06	1 50E-03	4 58E-03	1 11E-04	1078 24	17,000	2 1E+04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E+01	6 60E-04	1 61E-05	969 27	15,000	2 1E+04	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	1015 70	16,000	2 1E+05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	4 9E+03	0 0E+00
309002 Aldrin	1 28E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E+03	0 0E+00
319846 alpha-HCH (alpha-BHC)	4 57E+01	6 26E-02	1 00E-05	2 40E+01	3 05E-05	7 44E-07	839 36	13,000	5 3E+04	0 0E+00
319857 beta-HCH (beta-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	587 38	7,000	3 7E+05	2 0E+02
542756 1,3-Dichloropropane	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 77E-02	770 00	12,938	1 9E+04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	4 17E-06	9 89E+03	9 23E-05	9 51E-06	748 87	11,000	2 0E+03	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 32E-02	8 23E-06	2 00E+01	3 90E-04	9 51E-06	848 76	13,000	2 6E+03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	873 31	14,000	3 2E+04	0 0E+00
1096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E+04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E+04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E+04	0 0E+00
53463219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E+04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

1,1,2,2-Tetrachloroethane

79345 2400

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., R/C (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8,996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{se} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm ³ /cm ³)	Floor-wall seam penetrometer, X_{crack} (cm)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	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)	Stratum A effective diffusion coefficient, $D_{eff,A}^{eff}$ (cm ² /s)	Stratum B effective diffusion coefficient, $D_{eff,B}^{eff}$ (cm ² /s)	Stratum C effective diffusion coefficient, $D_{eff,C}^{eff}$ (cm ² /s)	Capillary zone effective diffusion coefficient, $D_{eff,ca}^{eff}$ (cm ² /s)	Total overall effective diffusion coefficient, $D_{eff,t}^{eff}$ (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.23E-04	5.83E-04	8.13E-04	2545.32

Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{soil} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack}^{eff} (cm ² /s)	Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	8.36E+00	0.10	6.67E-01	2.90E-03	3.84E+02	3.63E-06	3.03E-05	5.8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.38E+03	NA	1.38E+03	2.97E+06	1.38E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vs} (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.83E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+06	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57149	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.89E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.79E-02	5.34E-04	25	422.35	596.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	6.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acanaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 88	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	3 23E+00	3 34E-01	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 33E+00	3 34E-01	8 15E-08	899 00	13,977	5 7E-06	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	8 15E-08	738 00	10,206	2 2E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	748 40	10,373	0 0E+00	1 4E+01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	705 00	9,700	0 0E+00	2 0E+01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	675 00	9,572	0 0E+00	1 8E+02
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	759 13	13,000	0 0E+00	3 5E+01
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	719 00	10,566	0 0E+00	2 0E+03
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	617 20	8,501	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	636 00	8,737	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	707 60	11,329	0 0E+00	7 0E+02
106487 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	616 20	8,525	0 0E+00	7 0E+00
107062 1,2-Dichlorobenzene	6 16E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	684 75	9,271	0 0E+00	8 0E+01
106478 p-Chloroaniline	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	754 00	11,689	0 0E+00	1 4E+02
108054 Vinyl acetate	5 25E+00	8 50E-06	9 20E-06	2 00E+04	2 10E-02	5 12E-04	561 00	7,643	2 8E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	519 13	7,800	0 0E+00	2 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	617 05	8,523	0 0E+00	7 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	591 79	7,930	0 0E+00	4 0E+01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	632 40	8,410	0 0E+00	2 0E+02
1153E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	1 02E-07	694 20	10,920	0 0E+00	2 1E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	657 15	9,000	3 3E-04	0 0E+00
117817 Bis(2-chloroethyl)ether	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	942 94	14,000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	862 22	15,000	0 0E+00	7 0E+02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	825 00	14,447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	873 00	13,121	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	725 00	10,471	0 0E+00	2 0E+01
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	708 17	11,000	0 0E+00	1 1E+02
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 03E-05	2 60E+03	3 21E-02	7 83E-04	814 00	13,467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 94E-02	678 20	8,000	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	620 20	8,288	5 8E-07	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	936 00	14,370	0 0E+00	1 1E+01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	9 39E-03	516 50	6,717	0 0E+00	7 0E+02
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 20E+05	6 56E-05	1 60E-06	1078 24	17,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	4 55E-03	1 11E-04	969 27	15,000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 20E+05	6 56E-05	1 60E-06	905 00	13,815	0 0E+00	1 4E+01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-03	3 88E-03	1 70E-04	1019 70	16,000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	2 40E-01	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
542758 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 44E-07	587 38	7,000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	770 00	12,938	1 9E-04	0 0E+00
821647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E+04
11096825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES

X

OR

YES

VERSION 1.2
September, 1998

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

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

156605 23 25

Chemical

trans-1,2-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_a (cm)	Thickness of soil stratum B, h_b (cm)	Thickness of soil stratum C, h_c (cm)	Totals must add up to value of L_{wt} (cell D28)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm^2)
16	15	2560 32	1005 84	274 32	1280 16		C	S

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg space pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RIC (mg/m^3)
7.07E-02	1.19E-05	9.39E-03	25	6,717	320.85	516.50	5.25E+01	6.30E+03	0.0E+00	7.0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A relative air permeability, k_{ra} (cm ²)	Stratum A effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.30E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$	Area of enclosed space below grade, A_g	Crack-to-total area ratio, η	Crack depth below grade, Z_{crack}	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$	Henry's law constant at ave groundwater temperature, H'_{rs}	Henry's law constant at ave groundwater temperature, H'_{rs}	Vapor viscosity at ave soil temperature, μ_{rs}	Stratum A effective diffusion coefficient, D_{eff}^A	Stratum B effective diffusion coefficient, D_{eff}^B	Stratum C effective diffusion coefficient, D_{eff}^C	Capillary zone effective diffusion coefficient, D_{eff}^{ca}	Total overall effective diffusion coefficient, D_{eff}^T	Diffusion path length, L_d
(cm ³ /s)	(cm ²)	(unitless)	(cm)	(cal/mol)	(atm-m ³ /mol)	(unitless)	(g/cm-s)	(cm ² /s)	(cm ² /s)	(cm ² /s)	(cm ² /s)	(cm ² /s)	(cm)
5.63E+04	9.24E+05	4.16E-04	15	7.073	2.73E-01	1.77E-04	2.87E-03	7.26E-04	4.33E-04	4.98E-04	6.92E-04	2545.32	

Convection path length, L_p (cm)	Source vapor conc, C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vbl} (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/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc, RIC (mg/m ³)
15	2.73E+02	0.10	6.87E-01	2.87E-03	3.84E+02	8.80E+03	3.24E-06	8.84E-04	NA	7.0E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
NA	8.26E+04	8.26E+04	6.30E+06	8.26E+04

INCREMENTAL RISK CALCULATIONS:

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.088	0.0082
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _a (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.59E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	860.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromochloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E-03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Dibromochloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	5.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloropropane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	398.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83328	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2.88E+02	2.56E-02	6.35E-06	1.08E+03	1.85E-05	4.51E-07	757.00	13.733	0.0E+00	2.8E+00
84742 Di-n-butyl phthalate	3.39E-04	4.38E-02	7.86E-06	1.12E+01	3.85E-08	9.39E-10	798.67	14.751	0.0E+00	3.5E-01
85887 Butyl benzyl phthalate	5.75E+04	1.74E-02	4.83E-06	2.69E+00	5.17E-05	1.26E-06	839.68	13.000	0.0E+00	7.0E-01
86306 N-Nitrosodiphenylamine	1.29E+03	3.12E-02	6.35E-06	3.51E+01	2.05E-04	5.00E-06	890.45	13.000	1.4E-06	0.0E+00
86737 Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.61E-03	6.37E-05	870.00	12.666	0.0E+00	1.4E-01
86748 Carbazole	3.39E+03	3.90E-02	7.03E-06	7.48E+00	6.26E-07	1.53E-08	899.00	13.977	5.7E-06	0.0E+00
87683 Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.23E+00	3.34E-01	8.15E-03	10.206	10.206	2.2E-05	0.0E+00
87885 Pentachlorophenol	5.92E+02	5.60E-02	6.10E-06	1.95E-03	1.00E-06	2.44E-08	813.20	14.000	3.4E-05	0.0E+00
88062 2,4,6-Trichlorophenol	3.81E+02	3.18E-02	6.25E-06	8.00E+02	3.19E-04	7.78E-06	749.03	12.000	3.1E-06	0.0E+00
91203 Naphthalene	5.90E-02	1.94E-02	7.50E-06	3.10E+01	1.98E-02	4.83E-04	754.03	10.373	1.3E-04	0.0E+00
91941 3,3-Dichlorobenzidine	7.24E+02	1.94E-02	6.74E-06	3.11E+00	1.64E-07	4.00E-09	748.40	13.000	1.3E-04	0.0E+00
95476 o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.13E-01	5.20E-03	630.30	8.661	0.0E+00	7.0E+00
95487 2-Methylphenol (o-cresol)	9.12E+01	7.40E-02	8.30E-06	2.60E+04	4.92E-05	1.90E-06	697.60	10.800	0.0E+00	1.8E-01
95501 1,2-Dichlorobenzene	6.17E+02	6.90E-02	1.56E+02	1.56E+02	7.79E-02	1.90E-03	705.00	9.700	0.0E+00	2.0E-01
95578 2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	675.00	9.572	0.0E+00	1.8E-02
95954 2,4,5-Trichlorophenol	1.60E+03	2.91E-02	7.03E-06	1.20E+03	1.78E-04	3.43E-06	759.13	13.000	0.0E+00	3.5E-01
98953 Nitrobenzene	6.48E+01	7.60E-02	8.60E-06	2.09E+03	9.84E-04	2.40E-05	719.00	10.566	0.0E+00	2.0E-03
100414 Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.23E-01	7.88E-03	617.20	8.501	0.0E+00	1.0E+00
100425 Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.13E-01	2.76E-03	684.75	11.329	0.0E+00	7.0E-02
105679 2,4-Dimethylphenol	3.89E+02	7.68E-02	8.44E-06	1.85E+02	3.14E-01	2.43E-03	647.21	9.271	0.0E+00	8.0E-01
106423 p-Xylene	6.17E+02	6.90E-02	1.01E-05	5.30E+03	1.36E-05	3.32E-07	754.00	11.689	0.0E+00	1.4E-02
106467 1,4-Dichlorobenzene	4.83E-02	4.83E-02	1.01E-05	5.30E+03	1.36E-05	3.32E-07	561.00	7.643	2.6E-05	0.0E+00
106478 p-Chloroaniline	1.04E-01	9.90E-06	9.90E-06	8.52E+03	4.01E-02	9.78E-04	519.13	7.800	0.0E+00	2.0E-01
107062 1,2-Dichloroethane	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.10E-02	5.12E-04	694.20	10.920	0.0E+00	2.1E+00
108064 Vinyl acetate	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.01E-01	7.34E-03	617.05	8.523	0.0E+00	7.0E+00
108383 m-Xylene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.63E-03	637.78	7.930	0.0E+00	4.0E-01
108907 Chlorobenzene	2.19E+02	7.30E-02	9.10E-06	8.28E+04	1.63E-05	3.98E-07	694.20	10.920	0.0E+00	2.1E+00
108952 Phenol	2.88E+01	8.20E-02	8.20E-06	1.72E+04	7.38E-04	1.80E-05	659.79	9.000	3.3E-04	0.0E+00
111444 Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.38E-04	1.80E-05	825.00	14.447	4.8E-04	0.0E+00
115297 Endosulfan	2.14E+03	1.15E-02	4.58E-06	5.10E-01	4.59E-04	1.12E-05	942.94	14.000	0.0E+00	2.1E-02
117817 Bis(2-ethylhexyl)phthalate	1.51E+07	3.51E-02	3.66E-06	3.40E-01	4.18E-06	1.02E-07	808.00	15.999	4.0E-06	0.0E+00
117840 Di-n-octyl phthalate	8.32E+07	1.51E-02	3.58E-06	2.00E-02	2.74E-03	6.68E-05	882.22	15.000	0.0E+00	7.0E-02
118741 Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	6.20E+00	5.41E-02	1.32E-03	825.00	14.447	4.8E-04	0.0E+00
120127 Anthracene	2.95E+04	3.24E-02	7.74E-06	4.34E-02	2.61E-03	6.51E-05	873.00	13.121	0.0E+00	1.1E+00
120821 1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	3.00E+02	5.82E-02	1.42E-03	725.00	10.471	0.0E+00	2.0E-01
120832 2,4-Dichlorophenol	1.47E+02	3.46E-02	8.77E-06	4.50E+03	1.30E-04	3.17E-06	708.17	11.000	0.0E+00	1.1E-02
121142 2,4-Dinitrotoluene	9.55E+01	2.03E-01	7.06E-06	2.70E+02	3.80E-06	9.27E-08	814.00	13.467	1.9E-04	0.0E+00
124481 Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.21E-02	7.83E-04	678.20	8.000	2.4E-05	0.0E+00
127184 Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.54E-01	1.84E-02	620.20	8.288	5.8E-07	0.0E+00
129000 Pyrene	1.05E+05	7.22E-02	7.24E-06	1.35E-01	4.51E-04	1.10E-05	936.00	14.370	0.0E+00	1.1E-01
156592 cis-1,2-Dichloroethylene	3.55E+01	7.07E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	544.00	7.192	0.0E+00	3.5E-02
156605 trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	516.50	6.717	0.0E+00	7.0E-02
193395 Indeno(1,2,3-cd)pyrene	3.47E+06	1.90E-02	5.66E-06	2.20E-05	6.56E-05	1.60E-06	1078.24	15.000	2.1E-04	0.0E+00
205992 Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.55E-03	1.61E-05	905.00	13.815	0.0E+00	1.4E-01
206440 Fluoranthene	1.07E+05	3.02E-02	6.35E-06	2.06E-01	6.60E-04	1.11E-04	1019.70	16.000	2.1E-05	0.0E+00
207089 Benzo(k)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.55E-03	1.61E-05	979.00	16.455	2.1E-06	0.0E+00
218019 Chrysene	3.98E+05	2.48E-02	6.21E-06	1.60E-03	3.88E-03	9.46E-05	839.37	13.000	4.9E-03	0.0E+00
309002 Aldrin	2.45E+06	1.32E-02	4.86E-06	1.80E-01	6.97E-03	1.70E-04	839.37	13.000	1.8E-03	0.0E+00
319846 alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.35E-04	1.06E-05	839.36	13.000	1.8E-03	0.0E+00
319857 beta-HCH (beta-BHC)	1.26E+03	1.42E-02	7.34E-06	2.00E+00	4.35E-04	1.06E-05	839.36	13.000	1.8E-03	0.0E+00
542756 1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.26E-01	7.44E-07	770.00	12.938	1.9E-04	0.0E+00
60202 2,6-Dinitrotoluene	6.92E+01	3.27E-02	7.17E-06	3.06E-05	7.46E-07	1.77E-02	746.87	11.000	2.0E-03	0.0E+00
621647 N-Nitrosod-n-propylamine	2.40E+01	5.45E-02	8.17E-06	9.89E+03	2.25E-06	2.25E-06	848.76	13.000	2.6E-03	0.0E+00
1024573 Heptachlor epoxide	8.32E+04	1.32E-02	4.23E-06	2.00E-01	3.90E-04	9.51E-06	1750.00	14.127	0.0E+00	3.0E-04
743976 Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	5.62E-02	4.67E-01	1.14E-02	873.31	14.000	3.2E-04	0.0E+00
8001352 Toxaphene	2.57E+05	1.16E-02	4.34E-06	7.40E-01	2.46E-04	6.00E-06	539.37	19.000	1.0E-04	0.0E+00
11096825 Aroclor 1260 (PCB-1260)	2.90E+05	1.38E-02	4.32E-06	8.00E-02	1.89E-01	4.60E-06	512.27	19.000	1.0E-04	0.0E+00
11097691 Aroclor 1254 (PCB-1254)	2.00E+05	1.56E-02	5.00E-06	5.70E-02	8.20E-02	2.00E-03	475.22	18.000	1.0E-04	0.0E+00
12674112 Aroclor 1016 (PCB-1016)	3.30E+04	2.22E-02	5.42E-06	4.20E-01	1.19E-02	2.90E-04	482.20	18.000	1.0E-04	0.0E+00
53469219 Aroclor 1242 (PCB-1242)	3.30E+04	2.14E-02	5.31E-06	4.20E-01	2.13E-02	5.20E-04				

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

156592 88

Chemical

cis-1,2-Dichloroethylene

ENTER Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{task} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_a (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,p}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., RfC (mg/m^3)
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

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $C_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_s (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, $H_{v,rs}$ (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, $H_{v,rs}$ (unitless)	Vapor viscosity at ave soil temperature, $\mu_{v,rs}$ (g/cm-s)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm ² /s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm ² /s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.19E-01	1.77E-04	2.98E-03	7.60E-04	4.56E-04	5.24E-04	7.28E-04	2545.32

Convection path length, L_p (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 bldg conc, $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RfC (mg/m ³)
15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	3.36E-06	NA	3.5E-02

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	9.48E+04	9.48E+04	3.50E+06	9.48E+04	NA	NA

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_a (cm ³ /cm ³)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.08	0.83	0.38	0.568	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.88	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.78E+03	1.82E-05	4.47E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67841	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67863	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72648	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	5.34E-04	1.60E-03	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75343	1,1-Dichloroethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.80E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	380.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 45E-06	3 10E+00	1 64E-07	4 00E-09	754 03	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E+02	6 74E-06	3 11E+01	1 64E-07	4 83E-04	748 40	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	572 53	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 68E-02	8 44E-06	1 83E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	581 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108393 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E-02
108957 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 98E-07	659 79	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	3 80E-07	942 94	9,000	0 0E+00	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	822 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	814 00	13,467	1 9E-04	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	678 20	8,000	2 4E-05	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	7 83E-04	620 20	8,288	5 8E-07	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	7 54E-01	1 84E-02	936 00	14,370	0 0E+00	1 1E-01
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 24E-01	1 10E-05	544 00	7,192	0 0E+00	3 5E-02
129000 Pyrene	1 05E+05	2 72E-02	1 13E-05	1 35E-01	4 51E-04	4 07E-03	516 50	17,000	2 1E-04	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	1 60E-08	969 27	15,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 11E-04	905 00	13,815	0 0E+00	1 4E-01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	2 26E-02	5 56E-06	2 20E+05	6 56E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 39E-03	979 00	16,455	2 1E-06	0 0E+00
208440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 97E-03	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	2 00E+00	6 97E-04	7 44E-07	587 38	7,000	3 7E-05	2 0E-02
309002 Aldrin	1 26E+03	4 57E+01	6 26E-02	1 00E-05	7 26E-01	1 77E-02	770 00	12,938	1 9E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 88E-03	7 48E-07	746 87	11,000	2 0E-03	0 0E+00
319857 beta-HCH (beta-BHC)	2 57E+05	1 16E-02	4 34E-06	2 46E-04	1 14E-02	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 14E-02	1750 00	14,127	0 0E+00	3 0E-04
605202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	4 67E-01	539 37	19,000	1 0E-04	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	475 22	18,000	1 0E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	475 22	18,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	2 46E-04	1 14E-02	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097651 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only;
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

1,2-Dichloroethane

107062 1.6

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2))
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_a (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)		Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)		Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)		Normal boiling point, T_b ($^{\circ}\text{K}$)		Critical temperature, T_c ($^{\circ}\text{K}$)		Organic carbon partition coefficient, K_{oc} (cm^3/g)		Pure component water solubility, S (mg/L)		Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹		Reference conc., RIC (mg/m^3)	
		$\Delta H_{v,b}$		T_R		$\Delta H_{v,b}$		T_b		T_c		K_{oc}		S		URF		RIC	
1.04E-01	9.90E-06	9.78E-04		25		7.643		356.65		561.00		1.74E+01		8.52E+03		2.6E-05		0.0E+00	

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{we} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.457	2.64E-02	1.77E-04	4.22E-03	1.09E-03	6.67E-04	7.62E-04	1.06E-03	2545.32

Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, $Q_{v,bldg}$ (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., $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
15	2.64E+01	0.10	6.67E-01	4.22E-03	3.84E+02	4.75E+02	4.33E-06	1.15E-04	2.6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc. carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
8.17E+02	NA	8.17E+02	8.52E+06	8.17E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.83	0.38	0.068
CL	0.28	0.019	1.31	0.237	0.41	0.095
L	1.04	0.036	1.56	0.359	0.43	0.078
LS	14.59	0.124	2.28	0.561	0.41	0.057
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100
SCL	1.31	0.059	1.48	0.324	0.39	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.065

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ² /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.89E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.89E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.29E-01	5.58E-02	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.5E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+02	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.56	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	6.21E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 28E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 03E-04	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	25	570 44	870 00	12,566	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	3 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 89E+02	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	9 78E-04	25	356 65	581 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 80E-07	25	455 02	694 20	10,920	0 0E+00	2 1E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	3 80E-05	25	451 15	659 79	9,000	0 0E+00	0 0E+00
115237 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 12E-05	25	674 43	942 94	14,000	0 0E+00	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	1 32E-03	25	582 55	825 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	6 51E-05	25	815 18	873 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 85E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-02
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	1 42E-03	25	482 15	708 17	11,000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 17E-06	25	590 00	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	9 27E-08	25	416 14	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	7 83E-04	25	394 40	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	25	667 95	936 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	1 10E-05	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 07E-03	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	1 61E-05	25	655 95	905 00	16,000	2 1E-05	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	8 29E-07	25	753 15	1019 70	16,455	2 1E-06	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 39E-06	1 50E-03	9 48E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
210789 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	2 00E+00	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
309002 Aldrin	1 23E+03	4 22E-02	7 34E-06	2 40E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 23E+03	4 22E-02	7 34E-06	2 40E-01	7 48E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	4 22E-02	7 34E-06	2 40E-01	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	1 14E-02	25	657 15	873 31	14,000	3 2E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	6 00E-06	25	515 50	539 37	19,000	1 0E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	4 60E-03	25	407 50	512 27	19,000	1 0E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	2 48E-04	25	657 15	873 31	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 97E+05	1 16E-02	4 34E-06	7 40E-01	4 60E-03	25	407 50	512 27	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	25	377 50	475 22	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 00E-03	25	340 50	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

56235 1.65

Chemical

Carbon tetrachloride

ENTER Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2580 32	1005 84	274 32	1280 16		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_s (cm)	ENTER Enclosed space floor width, W_s (cm)	ENTER Enclosed space height, H_s (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RFC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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, $\theta_{v,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	5.46E-04	7.59E-04	2545.32
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vol} (cm^3/s)	Crack effective diffusion coefficient, $D_{crack}^{D_{crack}}$ (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} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-s}^{-1}$)	Reference conc., RfC (mg/m ³)			
15	8.53E+02	0.10	6.67E-01	3.19E-03	3.84E+02	3.77E+03	3.46E-06	2.95E-03	1.5E-05	N/A			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc. , carcinogen (ug/L)	Indoor exposure groundwater conc. , noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final Indoor exposure groundwater conc. (ug/L)
5.50E+01	NA	5.50E+01	7.93E+05	5.50E+01

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.018
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCS	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.80E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.69E-05	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71555	1,1,1-Trichloroethane	1.05E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.88E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E+01
85637 Butyl benzyl phthalate	5 75E+04	4 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 06E-04	5 00E-06	890 45	13,000	0 0E+00	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	3 18E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 4E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 1E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E+01
9848E+01	6 48E+01	7 60E-02	8 69E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	636 00	8,737	0 0E+00	1 0E+00
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	707 60	11,329	0 0E+00	7 0E+02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	617 20	8,501	0 0E+00	1 0E+00
106423 p-Xylene	3 88E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	706 00	11,689	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E+01
106478 p-Chloroaniline	1 74E+01	1 04E-01	9 90E-06	5 30E+03	1 36E-05	3 32E-07	754 00	8,523	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	9 20E-06	2 00E+04	4 01E-02	9 78E-04	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	4 07E+02	7 00E-02	7 80E-06	1 61E+02	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E+01
108383 m-Xylene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	7,930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	0 0E+00	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-06	942 94	14,000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	825 00	14,447	4 6E-04	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	773 00	10,471	0 0E+00	2 0E+01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	11,000	0 0E+00	1 1E+02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	516 50	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	13,815	0 0E+00	1 4E+01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	4 55E-03	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	13,815	0 0E+00	1 4E+01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	839 36	13,000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 05E-05	7 44E-07	587 38	7,000	3 7E-05	2 0E+02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	3 05E-05	7 44E-07	587 38	7,000	3 7E-05	2 0E+02
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	7 26E-06	2 80E+03	1 00E-05	1 77E-02	770 00	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	746 87	11,000	2 0E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	1750 00	14,127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	873 31	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	539 37	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	517 50	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 20	18,000	1 0E-04	0 0E+00
1267412 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 12
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)
C_w
(μg/L)

ENTER
Initial
groundwater
conc,
C_w
(μg/L)

Chemical

Benzene

71432

2.525

ENTER Average groundwater temperature, T _s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L _f (cm)	ENTER Depth below grade to water table, L _{wr} (cm)	ENTER Thickness of soil stratum A, h _A (cm)	ENTER Thickness of soil stratum B, h _B (cm)	ENTER Thickness of soil stratum C, h _C (cm)	ENTER Totals must add up to value of L _{wr} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k _v (cm ²)
16	15	2560 32	1005 84	274 32	1280 16		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ _s ^A (g/cm ³)	ENTER Stratum A soil total porosity, n ^A (unitless)	ENTER Stratum A soil water-filled porosity, θ _w ^A (cm ³ /cm ³)	ENTER Stratum B soil dry bulk density, ρ _s ^B (g/cm ³)	ENTER Stratum B soil total porosity, n ^B (unitless)	ENTER Stratum B soil water-filled porosity, θ _w ^B (cm ³ /cm ³)	ENTER Stratum C soil dry bulk density, ρ _s ^C (g/cm ³)	ENTER Stratum C soil total porosity, n ^C (unitless)	ENTER Stratum C soil water-filled porosity, θ _w ^C (cm ³ /cm ³)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L _{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s ²)	ENTER Enclosed space floor length, L _g (cm)	ENTER Enclosed space floor width, W _g (cm)	ENTER Enclosed space height, H _g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	981	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RIC (mg/m^3)
8.80E-02	9.80E-06	5.56E-03	25	7,342	353.24	562.16	5.89E+01	1.75E+03	8.3E-06	0.0E+00

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, $\theta_{A,A}$ (cm^3/cm^3)	Stratum B soil air-filled porosity, $\theta_{B,B}$ (cm^3/cm^3)	Stratum C soil air-filled porosity, $\theta_{C,C}$ (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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, $\theta_{v,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2545.32	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, $D_{eff,A}^*$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{eff,B}^*$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{eff,C}^*$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.061	3.64E-03	1.53E-01	1.77E-04	3.57E-03	9.05E-04	5.40E-04	6.21E-04	8.63E-04	2545.32
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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, $\exp(\text{Pe}^*)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc, R/C (mg/m ³)			
15	1.53E+02	0.10	6.67E-01	3.57E-03	3.84E+02	1.47E+03	3.78E-06	5.80E-04	8.3E-06	N/A			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
5.05E+02	NA	5.05E+02	1.75E+06	5.05E+02

INCREMENTAL RISK CALCULATIONS

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

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

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCS	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R_{fc} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Endrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.00E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.68E-05	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	4.46E-06	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDO	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethane)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75232	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.05E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-05	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.12E+06	1.61E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	532.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	9.10E-06	7.90E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.09E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-04	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	2 61E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	2 0E+01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	1 90E-03	575 00	13,000	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	759 13	13,000	0 0E+00	3 5E+01
99953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	7 88E-03	617 20	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	2 76E-03	636 00	8,501	0 0E+00	1 0E+03
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	707 60	11,329	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	884 75	8,525	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	927 1	9,271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	3 32E-07	754 00	11,689	0 0E+00	1 4E+02
106478 p-Chloroaniline	6 61E+01	1 04E-01	9 90E-06	5 30E+03	1 38E-05	9 78E-04	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	7 38E-04	7 38E-05	1 80E-05	859 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	4 59E-04	1 12E-05	942 94	14,000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 18E-06	1 02E-07	805 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	5 41E-02	1 32E-03	862 22	15,000	0 0E+00	7 0E+02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	825 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	873 00	10,471	0 0E+00	1 1E+02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	5 82E-02	1 42E-03	725 00	11,000	0 0E+00	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	7 83E-04	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	936 00	14,370	0 0E+00	1 1E+01
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	544 00	7,192	0 0E+00	3 5E+02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 89E-01	9 39E-03	516 50	16,455	2 1E-06	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	708 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 28E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 00E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 28E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E+03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 06E-05	1 77E-02	587 38	7,000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 48E-07	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	746 87	11,000	2 0E+03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 15E-06	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

YES ☐

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

67663 917 5

Chloroform

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm) Totals must add up to value of L_{wt} (cell D28)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	B	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43

ENTER Enclosed space floor thickness, L_{encl} (cm)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

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

Used to calculate risk-based groundwater concentration

704 982

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$)	Reference conc., RfC (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2027.16	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.42	0.126	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)			Area of enclosed space below grade, A_B (cm^2)	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)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (cm^2/s)	Capillary zone effective diffusion coefficient, $D_{eff,ca}$ (cm^2/s)	Total overall effective diffusion coefficient, $D_{eff,T}$ (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	0.00E+00	6.00E-04	1.46E-03	2027.16
			Crack-to-total area ratio, η (unitless)	Average vapor flow rate into bldg., $Q_{v,bldg}$ (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m^3)			
	15	1.04E+02	0.10	6.67E-01	4.22E-03	3.84E+02	4.80E+02	5.92E-06	6.17E-04	2.3E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
1.72E+02	NA	1.72E+02	7.92E+06	1.72E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)		
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092		
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016		
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020		
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040		
S	29.70	0.145	2.68	0.627	0.43	0.044	0.044		
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.025		
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029		
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046		
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039		
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056		
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011		
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030		

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant		Henry's law constant at reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
						Henry's law constant at reference temperature, H' (unitless)	H (atm·m ³ /mol)						
50293 DDT		2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328 Benzo(a)pyrene		1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285 2,4-Dinitrophenol		1.00E-02	2.73E-02	9.06E-06	2.79E-03	2.79E-03	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703 Dibenz(a,h)anthracene		3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
55235 Carbon tetrachloride		1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553 Benz(a)anthracene		3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749 Chlordane		1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899 gamma-HCH (Lindane)		1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571 Dieldrin		2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
600E-01 Benzoic Acid		6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641 Acetone		5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663 Chloroform		3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721 Hexachloroethane		1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363 Butanol		6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432 Benzene		5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556 1,1,1-Trichloroethane		1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208 Endrin		1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435 Methoxychlor		9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548 DDE		1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559 DDE		4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	638.44	860.38	13,000	9.7E-05	0.0E+00
74839 Methyl bromide		1.05E+01	7.28E-02	1.21E-05	1.62E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014 Vinyl chloride (chloroethene)		1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092 Methylene chloride		1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150 Carbon disulfide		4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	595.00	9,479	1.1E-06	0.0E+00
75274 Bromodichloromethane		5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343 1,1-Dichloroethane		3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354 1,1-Dichloroethylene		5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448 Heptachlor		1.41E+06	1.12E-02	5.89E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474 Hexachlorocyclopentadiene		2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591 Isophorone		4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875 1,2-Dichloropropane		4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	1.6E-05	0.0E+00
79005 1,1,2-Trichloroethane		5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016 Trichloroethylene		1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345 1,1,2,2-Tetrachloroethane		9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329 Acenaphthene		7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 08E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+00	1 64E-07	4 00E-09	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	25	580 26	754 03	13 000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 11E+01	4 83E-02	1 01E-05	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	412 27	617 05	8 523	0 0E+00	4 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	383 78	591 79	7 930	0 0E+00	2 0E-02
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	404 87	632 40	8 410	0 0E+00	2 1E-02
108907 Chlorobenzene	7 30E-02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	455 02	694 20	10 920	0 0E+00	0 0E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	657 15	806 00	15 999	4 0E-06	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 58E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	25	704 09	882 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	875 00	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	5 82E-02	1 42E-03	1 42E-03	25	482 15	708 17	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	416 14	678 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 08E-05	2 60E+03	3 21E-02	7 83E-04	25	394 40	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	667 95	936 00	14 370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	333 65	544 00	7 192	0 0E+00	3 9E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	25	715 90	969 27	15 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	9 39E-03	25	655 95	905 00	13 815	0 0E+00	1 4E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 09E-04	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	1 50E-03	4 55E-03	1 60E-06	25	596 55	839 36	13 000	1 8E-03	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	4 86E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13 000	3 5E-04	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	2 40E-01	3 05E-05	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E-02
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 88E-03	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
319848 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 88E-03	7 46E-07	25	509 60	746 87	13 000	2 0E-03	0 0E+00
319857 beta-HCH (beta-BHC)	5 47E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	9 15E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	1 14E-02	25	657 15	873 31	14 000	3 2E-04	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	6 00E-06	25	429 50	539 37	19 000	1 0E-04	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	4 60E-03	25	402 50	537 50	19 000	1 0E-04	0 0E+00
7439976 Mercury (elemental)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
8001352 Toxaphene	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☐ X

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

Trichloroethylene

79016 201 65

ENTER Average groundwater temperature, T_g ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D23) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2))	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2))
16	15	2042 16	762	1280 16	0	B	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, θ_w^C (cm^3/cm^3)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	17	0.42	0.27	17	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2027 16	0.230	0.150	0.130	0.419	9.30E-10	0.746	6.98E-10	17.05	0.42	0.126	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A relative air permeability, k_{ra} (cm ²)	Stratum A 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_{rock} (cm)
Bldg ventilation rate, $C_{building}$ (cm ³ /s)		Area of enclosed space below grade, A_s (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{f,TS}$ (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.18E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	0.00E+00	4.52E-04	1.11E-03	2027 16
Convection path length, L_p (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 number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)			
	15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	5.10E-06	1.42E-03	1.7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.01E+03	NA	1.01E+03	1.10E+06	1.01E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.03	0.083	0.38	0.088	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzol(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.78E+03	1.82E-05	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.80E-02	1.99E-03	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	25	613.32	842.25	13,000	4.6E-03	0.0E+00
60550	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.80E-06	5.00E+01	1.59E-01	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	25	347.24	545.00	7,136	0.0E+00	1.0E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	2.76E+03	1.11E+00	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.05E-05	6.74E+03	6.56E-02	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	25	388.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-06	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 13E-01	1 78E-02	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	5 84E-02	8 69E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+02
106423 p-Xylene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25	503 65	754 00	11 889	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	8 50E-02	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 1E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 58E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 60E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	482 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	3 40E-05	1 61E-05	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	7 26E-01	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E+02
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	1 32E-02	4 23E-06	2 00E+01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 8E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 90E+05	1 39E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12874112 Aroclor 1016 (PCB-1016)	53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

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

YES ☐

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)	Chemical 1,1,2-Trichloroethane		ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
79005	2 685					
ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)
16	15	2042 16	762	1280 16	0	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_a (cm)	ENTER Enclosed space height, H_a (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-05	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc. RfC (mg/m ³)
7.60E-02	8.80E-06	9.12E-04	25	8.322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2027.16	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.42	0.126	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{ae} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A relative air permeability, k_{ra} (cm^2)	Stratum A 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)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	0.00E+00	4.79E-04	1.13E-03	2027.16
			Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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 number, $\exp(P_e)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$)	Reference conc, RtC (mg/m^3)			
	15	2.33E+01	0.10	6.67E-01	3.17E-03	3.84E+02	3.68E+03	5.15E-06	1.20E-04	1.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.27E+03	NA	1.27E+03	4.42E+06	1.27E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.088
CL	0.26	0.019	1.31	0.237	0.096
L	1.04	0.036	1.56	0.359	0.078
LS	14.59	0.124	2.28	0.561	0.057
S	29.70	0.145	2.68	0.627	0.045
SC	0.12	0.027	1.23	0.187	0.100
SCL	1.31	0.059	1.48	0.324	0.039
SI	0.25	0.016	1.37	0.270	0.046
SIC	0.02	0.005	1.09	0.083	0.070
SICL	0.07	0.010	1.23	0.187	0.089
SIL	0.45	0.020	1.41	0.291	0.067
SL	4.42	0.075	1.89	0.471	0.065

Chemical Properties Lookup Table											
CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°C)	Critical temperature, T_c (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)
50293 DDT		2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000
50328 Benzo(a)pyrene		1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000
51285 2,4-Dinitrophenol		1.00E-02	2.73E-02	9.06E-06	2.78E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000
53703 Dibenz(a,h)anthracene		3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000
56235 Carbon tetrachloride		1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127
56553 Benz(a)anthracene		3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000
57749 Chlordane		1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000
58899 gamma-HCH (Lindane)		1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	596.55	839.36	13,000
60571 Dieldrin		2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000
65850 Benzoic Acid		6.00E-01	5.36E-02	7.97E-06	3.50E-03	6.31E-05	1.54E-06	25	720.00	751.00	10,000
67641 Acetone		5.75E-01	1.24E-01	1.14E-05	1.00E-06	1.59E-03	3.88E-05	25	329.20	508.10	6,955
67663 Chloroform		3.98E+01	1.04E-01	1.00E-05	7.92E-03	1.50E-01	3.66E-03	25	334.32	536.40	6,968
67721 Hexachloroethane		1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	3.88E-03	25	458.00	695.00	9,510
71363 Butanol		6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346
71432 Benzene		5.89E+01	8.80E-02	9.80E-06	1.75E-03	2.28E-01	5.58E-03	25	353.24	562.16	7,342
71556 1,1,1-Trichloroethane		1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136
72208 Endrin		1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000
72435 Methylchlor		9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000
72548 DDE		1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000
72559 DDE		4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000
74839 Methyl bromide		1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714
75014 Vinyl chloride (chloroethene)		1.86E+01	1.06E-01	1.23E-06	2.78E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250
75092 Methylene chloride		1.75E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706
75150 Carbon disulfide		4.57E+01	1.04E-01	1.00E-05	1.19E-03	1.24E+00	3.02E-02	25	319.00	552.00	6,391
75252 Bromoform		8.71E+01	1.49E-02	1.03E-05	3.10E-03	2.19E-02	5.34E-04	25	422.35	696.00	9,479
75274 Bromodichloromethane		5.50E+01	2.98E-02	1.06E-05	6.74E-03	6.56E-02	1.60E-03	25	363.15	585.85	7,000
75343 1,1-Dichloroethane		3.16E+01	7.42E-02	1.05E-05	5.06E-03	2.30E-01	5.61E-03	25	330.55	523.00	6,895
75354 1,1-Dichloroethylene		5.89E+01	9.00E-02	1.04E-05	2.25E-03	1.07E+00	2.61E-02	25	304.75	576.05	6,247
76448 Heptachlor		1.41E+06	1.12E-02	5.68E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000
77474 Hexachlorocyclopentadiene		2.00E+05	1.61E-02	7.21E-06	1.80E-01	1.11E+00	2.71E-02	25	512.15	746.00	10,931
78591 Isophorone		4.68E+01	6.23E-02	6.76E-06	1.20E-04	2.72E-04	6.63E-06	25	488.35	715.00	10,271
78875 1,2-Dichloropropane		4.37E+01	7.82E-02	8.73E-06	2.80E-03	1.15E-01	2.80E-03	25	369.52	572.00	7,590
79005 1,1,2-Trichloroethane		5.01E+01	7.80E-02	8.80E-06	4.42E-03	3.74E-02	9.12E-04	25	388.15	602.00	8,322
79016 Trichloroethylene		1.66E+02	7.90E-02	9.10E-06	1.10E-03	4.22E-01	1.03E-02	25	360.36	544.20	7,505
79345 1,1,2,2-Tetrachloroethane		9.33E+01	7.10E-02	7.90E-06	2.97E-03	1.41E-02	3.44E-04	25	419.60	661.15	8,996
83329 Acenaphthene		7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 86	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 866	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	7 48E+00	6 28E-07	1 53E-08	899 00	13 977	5 7E-06	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	3 34E-01	2 44E-08	738 00	10 206	2 2E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 18E-04	7 78E-06	813 20	14 000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 84E-07	8 43E-04	749 03	12 000	3 1E-06	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	754 03	10 373	0 0E+00	1 4E-01
95476 o-Xylene	6 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	630 00	8 661	0 0E+00	0 0E+00
95487 2-Methylphenol (o-cresol)	9 5501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	1 56E+02	7 79E-02	3 90E-04	697 60	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	759 13	9 700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	675 00	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	707 60	11 329	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	616 20	8 525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloraniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	632 40	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	9 10E-06	5 26E+02	2 72E-01	6 63E-03	617 05	7 930	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 80E-07	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 98E-05	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	3 51E-02	4 58E-06	5 10E-01	4 58E-04	1 12E-05	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 15E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	825 00	13 121	0 0E+00	1 1E-01
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14 447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	8 82E-02	1 42E-03	814 00	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	678 20	8 000	2 4E-07	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	989 27	14 370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	544 00	7 192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	965 00	13 815	0 0E+00	1 4E-01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	965 00	13 815	0 0E+00	1 4E-01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	516 50	6 717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 11E-04	989 27	15 000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	839 37	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E-04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
743976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
1096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

7041000

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)
 C_w
($\mu\text{g/L}$)

Chemical

Tetrachloroethylene

127184 6.4125

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042.16	762	1280.16	0	B	S	SI	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_s (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2027 16	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.42	0.126	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	0.00E+00	4.11E-04	1.01E-03	2027 16
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{bldg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc, RfC (mg/m^3)			
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	4.83E-06	2.27E-03	5.8E-07	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
1.84E+03	NA	1.84E+03	2.00E+05	1.84E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SiCL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SiL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant, H (atm·m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50283	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(g)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	17,127	1.5E-05	0.0E+00
56563	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.54E-06	25	613.32	842.25	13,000	4.6E-03	0.0E+00
6060E-01	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.51E-05	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	9.77E+04	1.56E-02	4.46E-06	1.33E+03	7.05E-01	1.72E-02	25	718.15	946.20	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	4.00E-06	25	651.02	848.49	14,000	0.0E+00	1.0E+00
72435	Methoxychlor	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	639.90	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75252	Bromofom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.61E-03	25	330.55	523.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	483.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	368.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+03	6.36E-03	1.55E-04	25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 08E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E+02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	6 89E-06	7 87E+03	8 20E-05	7 66E-03	25	411 52	616 20	8,525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E+02
106478 p-Chloroaniline	6 81E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 98E-07	25	356 65	561 00	7,643	2 8E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	1 42E-03	25	404 87	632 40	8,410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	6 13E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	582 55	825 00	14,447	4 6E-04	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	482 15	725 00	10,471	0 0E+00	2 0E+01
120121 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 42E-03	25	486 15	725 00	11,000	0 0E+00	1 1E+02
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	25	590 00	814 00	13,467	1 9E-04	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	25	416 14	678 20	8,000	2 4E-05	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	7 83E-04	25	394 40	620 20	8,288	5 8E-07	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	1 84E-02	25	667 95	936 00	14,370	0 0E+00	1 1E+01
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	333 65	544 00	7,192	0 0E+00	3 5E+02
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 61E-04	4 07E-03	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
156592 ds-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	25	715 90	969 27	15,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E+01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
205992 Benzob(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	2 06E-01	4 55E-03	9 46E-05	25	603 01	839 37	13,000	4 9E-03	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 70E-04	25	596 55	839 36	13,000	1 8E-03	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E+02
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	4 35E-04	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
319848 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 05E-05	7 46E-07	25	509 60	746 87	11,000	2 0E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	3 05E-05	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-01	1 00E-05	2 80E+03	7 26E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E+04
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	4 60E-06	25	402 50	539 37	19,000	1 0E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 00E-03	25	377 50	512 27	18,000	1 0E-04	0 0E+00
7439978 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	2 90E-03	25	340 50	475 22	18,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	5 20E-03	25	345 50	482 20	18,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 90E-03	25	345 50	482 20	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
53469218 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

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

VERSION 12
September, 1998

YES	X
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OR

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

YES ☐

ENTER	ENTER	Initial	ENTER
Chemical	groundwater	CAS No	conc.
(numbers only,	C _w		(μg/L)
no dashes)			
79345	138 175		
1,1,2,2-Tetrachloroethane			
ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T _s (°C)	Depth below grade to bottom of enclosed space floor, L _f (cm)	Depth below grade to water table, L _{wr} (cm)	Totals must add up to value of L _{wr} (cell D28)
			Thickness of soil stratum A, h _a (cm)
			Thickness of soil stratum B, h _b (cm)
			Thickness of soil stratum C, h _c (cm)
			Soil stratum directly above water table, (Enter A, B, or C)
			SCS soil type directly above water table
			User-defined stratum A soil vapor permeability, k _v (cm ²)
16	15	2042 16	762
			1280 16
			0
ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ _{dA} (g/cm ³)	Stratum A soil total porosity, n _A (unitless)	Stratum A soil water-filled porosity, θ _{wA} (cm ³ /cm ³)	Stratum A soil dry bulk density, ρ _{dB} (g/cm ³)
			Stratum B soil total porosity, n _B (unitless)
			Stratum B soil water-filled porosity, θ _{wB} (cm ³ /cm ³)
			Stratum C soil total porosity, n _C (unitless)
			Stratum C soil water-filled porosity, θ _{wC} (cm ³ /cm ³)
15	0.43	0.2	1.7
			0.42
			0.27
ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L _{encl} (cm)	Soil-bldg. pressure differential, ΔP (g/cm-s ²)	Enclosed space length, L _g (cm)	Enclosed space width, W _g (cm)
			Enclosed space height, H _g (cm)
			Floor-wall seam crack width, w (cm)
			Indoor air exchange rate, ER (1/h)
15	40	961	488
			961
			0.1
ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT _c (yrs)	Averaging time for noncarcinogens, AT _{nc} (yrs)	Exposure duration, ED (yrs)	Target risk for carcinogens, TR (unitless)
			Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350
			1.0E-06
			1
Used to calculate risk-based groundwater concentration			

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
9.46E+08	2027.16	0.230	0.150	0.130	0.419	9.36E-10	0.748	6.98E-10	17.05	0.42	0.126	0.294	3.844
Bldg. ventilation rate, Q_{bldg} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	10.480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	0.00E+00	4.94E-04	1.08E-03	2027.16
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)			
15	8.36E+00	0.10	6.67E-01	2.90E-03	3.84E+02	7.86E+03	5.02E-06	4.20E-05	5.8E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
1.00E+03	NA	1.00E+03	2.97E+06	1.00E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No.	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51265	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	353.24	562.16	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	374.24	545.00	7,342	8.3E-06	0.0E+00
71558	1,1,1-Trichloroethane	1.10E+02	7.80E-02	1.56E-02	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	12,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.69E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	487.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.66E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75032	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.18E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	6,895	5.0E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.03E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.80E-03	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.88E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	602.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	572.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03							

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567.15	757 00	13.733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14.751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 80	839 68	13.000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	6 37E-05	25	632 28	890 45	13.000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12.666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13.977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10.206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14.000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12.000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10.373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13.000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8.661	0 0E+00	7 0E-01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10.800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9.700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9.572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13.000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10.566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8.501	0 0E+00	1 0E-01
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8.737	0 0E+00	1 0E-00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11.329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	26	411 52	616 20	8.525	0 0E+00	7 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9.271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25	503 65	754 00	11.689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7.643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7.800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8.523	0 0E+00	7 0E-00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7.930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8.410	0 0E+00	2 0E-02
108962 Phenol	2 88E+01	6 92E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	455 02	694 20	10.920	0 0E+00	2 1E+00
11444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 50E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9.000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14.000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 58E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15.999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15.000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14.447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13.121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10.471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11.000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13.467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8.000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8.288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	7.192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	320 85	516 50	6.717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	1 60E-06	25	809 15	1078 24	17.000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-05	5 68E-06	2 20E+05	6 56E-05	1 11E-04	25	715 90	969 27	15.000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 61E-05	25	655 95	905 00	13.815	0 0E+00	-1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	753 15	1019 70	16.000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	9 46E-05	25	714 15	979 00	16.455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 77E-02	25	381 15	587 38	7.000	3 7E-05	2 0E-02
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	7 46E-07	25	558 00	770 00	12.938	1 9E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	2 25E-06	25	509 60	746 87	11.000	2 0E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	9 51E-06	25	613 96	848 76	13.000	2 6E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	1 06E-05	25	596 55	839 36	13.000	1 8E-03	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	7 26E-01	7 44E-07	25	596 55	587 38	13.000	5 3E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	3 08E-05	7 46E-07	25	558 00	770 00	12.938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 30E-04	9 51E-06	25	613 96	848 76	13.000	2 6E-03	0 0E+00
7439576 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14.127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14.000	3 2E-04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	25	402 50	539 37	19.000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19.000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18.000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18.000	1 0E-04	0 0E+00

7041012

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐ ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

cis-1,2-Dichloroethylene

156592 9 2275

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	0	B	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m^3)
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

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A relative air permeability, k_{ra} (cm^2)	Stratum A 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 permeator, X_{crack} (cm)
9.46E+08	2027.16	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.42	0.126	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{Ts} (unitless)	Vapor viscosity at ave soil temperature, μ_{Ts} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	0.00E+00	4.28E-04	1.04E-03	2027.16
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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 number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{s}^{-1}$)	Reference conc, RfC (mg/m^3)			
15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	4.91E-06	5.63E-04	NA	3.5E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
NA	6.48E+04	6.48E+04	3.50E+06	6.48E+04

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	4.42	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _B (°C)	Critical temperature, T _C (°C)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{TC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.89E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67683	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71558	1,1,1-Trichloroethane	9.77E+04	1.56E-02	4.46E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	1.00E+06	1.69E-02	4.76E-06	9.00E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.17E+01	1.01E-01	1.01E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	4.7E-07	3.0E+00
75150	Carbon disulfide	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.08E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	8.73E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	389.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.58E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	1 26E-06	25	600 00	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	2 44E-08	25	582 15	813 20	14,000	3 1E-06	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+00	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105675 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
107682 1,2-Dichloroethane	6 61E+01	4 83E-02	1 01E-05	5 30E+03	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
109552 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 63E-06	1 72E+04	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
113297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 12E-05	25	674 43	942 94	14,000	0 0E+00	0 0E+00
117817 Bis(2-ethoxyethyl)phthalate	1 51E+07	3 51E-02	3 66E-06	2 40E-02	1 02E-07	25	657 15	806 00	15,959	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	3 00E-01	6 88E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	1 32E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	4 25E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 33E-01	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
208440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	9 48E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	1 08E-05	25	598 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	1 08E-05	25	598 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 44E-07	25	598 55	839 36	13,000	5 3E-04	0 0E+00
605202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	7 48E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E+01	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	2 97E+05	1 16E-02	4 34E-06	7 40E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 50E+05	1 38E-02	4 32E-06	8 00E-02	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11097891 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒

OR

YES ☐VERSION 12
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

Carbon tetrachloride

56235 36 825

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{wt} (cell D28)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)
15	15	2042.16	762	1280.16	0		B	S
								SI

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space thickness, L_{encl} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space length, L_B (cm)	Enclosed space width, W_B (cm)	Enclosed space height, H_B (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RIC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	558.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, $\theta_{A,A}$ (cm^3/cm^3)	Stratum B soil air-filled porosity, $\theta_{B,B}$ (cm^3/cm^3)	Stratum C soil air-filled porosity, $\theta_{C,C}$ (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rp} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, η_{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)
9.48E+08	2027.16	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.42	0.128	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.18E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	0.00E+00	4.44E-04	1.09E-03	2027.16
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{sol} (cm^3/s)	Crack effective diffusion coefficient, D^{crack}_{diff} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation, $\text{Pedlet number, } \exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{s}^{-1}$)	Reference conc., RIC (mg/m ³)			
15	8.53E+02	0.10	6.67E-01	3.16E-03	3.84E+02	3.77E+03	5.06E-06	4.32E-03	1.5E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
3.76E+01	NA	3.76E+01	7.93E+05	3.76E+01

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.085	0.030

Chemical Properties Lookup Table																			
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R_{IC} (mg/m ³)						
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00						
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00						
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03						
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00						
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00						
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00						
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00						
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00						
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00						
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01						
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01						
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00						
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00						
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.00E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01						
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00						
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	7.05E-01	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00						
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03						
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	6.9E-05	0.0E+00						
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00						
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00						
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03						
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00						
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00						
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01						
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00						
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00						
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.81E-03	25	330.55	523.00	6,895	5.0E+00	5.0E-01						
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.81E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00						
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00						
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05						
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00						
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03						
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00						
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	4.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00						
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00						
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01						

VLOOKUP TABLES

	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84662 Diethylphthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-09	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
84742 Di-n-butyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
85687 Butyl benzyl phthalate	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86306 N-Nitrosodiphenylamine	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86737 Fluorene	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
86748 Carbazole	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-08	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87683 Hexachloro-1,3-butadiene	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
87865 Pentachlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91203 Naphthalene	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	5 84E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	638 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	3 89E+02	7 69E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	6 17E+02	6 90E-02	7 90E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 843	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 70E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 88E+01	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 80E-05	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	2 74E-03	1 02E-07	25	704 09	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	4 18E-08	6 68E-05	25	657 15	806 00	15 999	4 0E-06	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	814 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 03E-05	2 60E+03	3 21E-02	7 83E-04	25	590 00	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193393 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	6 97E-03	9 46E-05	25	714 15	839 37	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319848 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 77E-02	25	596 55	839 36	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 77E-02	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542758 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 25E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	25	509 80	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 25E-06	25	613 96	848 76	13 000	2 8E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041024

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒

OR

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

YES ☐

ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)

67863 6.24

Chemical

Chloroform

ENTER Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Thickness of soil stratum D, h_D (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499.36	853.44	304.8	1341.12		C	SC	L

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	981	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc , RfC (mg/m^3)
1.04E-01	1.00E-05	3.66E-03	25	6.988	334.32	538.40	3.98E+01	7.92E+03	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{se} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A relative air permeability, k_{ra} (cm^2)	Stratum A 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_{seam} (cm)
9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} (unitless)	Henry's law constant at ave groundwater temperature, H_{ts} (unitless)	Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	8.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	6.40E-04	1.63E-04	9.14E-04	2484.36

Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$)	Reference conc., RfC (mg/m ³)
15	1.04E+02	0.10	2.89E+00	4.22E-03	4.31E+11	5.40E-06	5.62E-04	2.3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.88E+02	NA	1.88E+02	7.92E+06	1.88E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	Soil Properties Lookup Table			θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	N (unitless)	M (unitless)				0.0092
CL	0.26	0.019	1.31	0.237		0.38	0.068	0.016
LC	1.04	0.036	1.56	0.359		0.43	0.095	0.020
LS	14.59	0.124	2.28	0.561		0.41	0.078	0.040
S	29.70	0.145	2.68	0.627		0.43	0.057	0.040
SC	0.12	0.027	1.23	0.187		0.38	0.045	0.044
SCL	1.31	0.059	1.48	0.324		0.39	0.100	0.025
SL	0.25	0.016	1.37	0.270		0.46	0.100	0.029
SIC	0.02	0.005	1.09	0.083		0.26	0.034	0.0048
SICL	0.07	0.010	1.23	0.187		0.43	0.070	0.0039
SIL	0.45	0.020	1.41	0.291		0.45	0.089	0.0056
SL	4.42	0.075	1.89	0.471		0.41	0.067	0.011
							0.065	0.030

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	1.47E-07	25	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	895.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.98E-01	6.19E-04	1.51E-05	25	842.25	13,000	4.6E-03	0.0E+00
68850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	693.00	10,346	0.0E+00	3.5E-01
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	565.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	552.16	7,342	8.3E-06	0.0E+00
71432	Benzene	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	848.49	14,000	0.0E+00	1.1E-03
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	487.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	552.00	6,391	7.0E-01	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	595.85	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.81E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	562.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.58E-04	25	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 99E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 81E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-08	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+00	1 84E-07	4 00E-09	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	13,000	1 3E-04	0 0E+00
95476 o-Xylene	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	25	560 26	754 03	13,000	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	454 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	8 12E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	8 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-03	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+06	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dinitrobenzene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
12481 Chlorobromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
129000 Pyrene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
156592 cis-1,2-Dichloroethylene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	938 00	14,370	0 0E+00	1 1E-01
156605 trans-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13,815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	5 62E-06	1 80E-03	6 97E-03	1 70E-04	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 43E+06	1 32E-02	7 34E-06	1 80E-03	3 88E-03	9 46E-05	25	603 01	839 37	13,000	4 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 11E-04	25	596 55	839 36	13,000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 11E-04	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621847 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 8E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041030

DATA ENTRY SHEET

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

YES ☒

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

79016 61.41538462

Trichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499.36	853.44	304.8	1341.12	C	SC	L	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., RFC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844
Source-building separation, L_r (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_w (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A relative air permeability, k_{ra} (cm^2)														
Stratum A effective vapor permeability, k_v (cm^2)														
Thickness of capillary zone, L_c (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)														
Bldg ventilation rate, $Q_{building}$ (cm^3/s)														
Area of enclosed space below grade, A_g (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)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)														
Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg., Q_{total} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D^{crack} (cm^2/s)														
Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-s}^{-1}$)														
Reference conc, RfC (mg/m ³)														
15	2.78E+02	0.10	2.89E+00	3.20E-03	3.84E+02	2.10E+15	4.17E-06	1.16E-03	1.7E-06	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
1.24E+03	NA	1.24E+03	1.10E+06	1.24E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.58	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25.715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E+02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25.605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	7.93E+02	6.03E-07	1.47E-08	25.743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	9.40E-03	1.25E+00	3.05E-02	25.349.90	556.60	15,000	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	1.37E-04	1.37E-04	3.34E-06	25.708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25.624.24	889.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25.596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25.613.32	842.25	13,000	4.6E-03	0.0E+00
65950	Benzoic Acid	6.00E-01	5.38E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25.720.00	751.00	10,000	0.0E+00	3.5E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25.329.20	508.10	6,955	0.0E+00	0.0E+00
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25.334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25.458.00	595.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25.390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	3.61E-04	5.56E-03	25.353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25.347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25.718.15	986.20	12,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25.851.02	848.49	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25.639.90	863.77	13,000	9.7E-05	0.0E+00
72558	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25.636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25.276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25.259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25.319.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25.319.00	552.00	6,391	7.0E-01	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25.422.35	596.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25.363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25.330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25.304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25.603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25.512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E-01	6.23E-02	7.76E-06	1.20E+04	2.72E-04	6.63E-06	25.488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25.369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25.386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25.360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25.419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25.550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 23E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	8 00E-06	3 10E+02	1 13E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	7 87E+03	8 20E-05	2 06E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 06E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
107067 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	3 72E-07	25	356 65	754 00	11,689	0 0E+00	1 4E-02
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,643	2 6E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	697 05	7,800	0 0E+00	2 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	8,523	0 0E+00	7 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	7,930	0 0E+00	4 0E-01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
115297 Endosulfen	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	704 09	882 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E+02	2 74E-03	6 68E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25	704 09	882 22	15,000	0 0E+00	7 0E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 33E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzof(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	6 97E-03	9 48E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 88E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	598 55	839 36	13,000	1 8E-03	0 0E+00
319957 beta-HCH (beta-BHC)	4 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	598 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	1 57E+01	6 26E-01	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041036

DATA ENTRY SHEET

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

YES ☐ X

OR

YES ☐VERSION 12
September, 1998

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

ENTER ENTER
Chemical Initial
CAS No groundwater
(numbers only, conc.,
 C_w
no dashes) ($\mu\text{g/L}$)

Chemical

79005 2 373076923

1,1,2-Trichloroethane

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_a (cm)	Thickness of soil stratum B, h_b (cm)	Thickness of soil stratum C, h_c (cm)	Totals must add up to value of L_{wt} (cell D28)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499.36	853.44	304.8	1341.12		C	SC	L

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8.322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844
Source-building separation, L_r (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_c (cm)	Total porosity in capillary zone, n_c (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,c}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,c}$ (cm^3/cm^3)	Floor-wall seam penetrator, X_{crack} (cm)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	9.24E+05	4.16E-04	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	5.10E-04	1.70E-04	7.35E-04	2484.36
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)			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 number, $\exp(Pe_f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc, RIC (mg/m ³)			
15	2.33E+01	0.10	2.89E+00	3.17E-03	3.84E+02	2.99E+15	4.43E-06	1.03E-04	1.6E-05	NA				

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)
1.47E+03	NA	1.47E+03	4.42E+06	1.47E+03	NA	NA

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ^a (unitless)	Henry's law constant at reference temperature, H (atm·m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,s} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(e)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-08	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	980.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56563	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
63650	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.89E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	10,346	0.0E+00	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	9,510	4.0E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	3.5E-01
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-01	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethane)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.80E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.99E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	389.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	368.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E-03	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E-01	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E-01	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	2 44E-08	25	582 15	813 20	14,000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E-02	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E-04	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E-02	7 78E-02	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E-04	1 60E-02	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 08E+02	5 84E-02	8 69E-06	7 87E+03	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	7 68E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	25	503 65	754 00	11,889	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-05	8 52E-03	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	7 34E-03	25	412 77	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+07	6 92E-01	7 53E-06	1 72E+04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	2 00E-02	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 56E-06	2 00E-02	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 58E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 65E-06	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 36E-06	2 06E-01	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 66E-06	8 00E-04	8 29E-07	25	733 15	1019 70	16,000	2 1E-05	0 0E+00
219019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-03	9 48E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	1 06E-05	25	586 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 28E+03	1 42E-02	7 34E-06	2 40E-01	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542758 1,3-Dichloropropene	4 57E+01	2 66E-02	1 00E-05	2 80E+03	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 82E-02	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 00E-03	25	377 50	517 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

127184 1 866923077

Chemical

Tetrachloroethylene

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, (Enter value or 0) h_a (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_b (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499.36	853.44	304.8	1341.12	C	SC	L	

ENTER Stratum A bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil dry porosity, n^A (unitless)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$)	Reference conc., RIC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8 288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k (cm ²)	Stratum A soil relative permeability, k_{rg} (cm ²)	Stratum A 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)
9.48E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	1.05E-04	6.24E-04	2484.36
Convection path length, L_p (cm)	Source vapor conc, C_{source} (ug/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 number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, RIC (mg/m ³)			
15	4.71E+02	0.10	2.89E+00	2.92E-03	3.84E+02	6.50E+16	3.81E-06	1.80E-03	5.8E-07	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
2.34E+03	NA	2.34E+03	2.00E+05	2.34E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_a (cm ³ /cm ³)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
IL	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ² /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	97E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-04	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	8.85E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.86E-03	25	334.32	536.40	9,910	4.0E-06	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.00E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E+03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	526.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+08	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.83E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	389.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.53E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-10	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-05	9 39E-10	798 67	14,751	0 0E+00	3 5E+01
85637 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,866	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	749 03	12,000	3 1E-06	0 0E+00
9 1203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E+01
9 1941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-03	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	1 90E-03	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	719 00	13,000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 00E-06	2 09E+03	9 84E-04	2 40E-05	759 13	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 08E+02	5 84E-02	6 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,843	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	632 40	8,410	0 0E+00	2 0E+02
10907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10,920	0 0E+00	2 1E+00
109552 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	3 40E-01	4 18E-06	1 12E-05	825 00	14,447	4 8E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-08	5 10E+01	4 59E-04	1 02E-07	808 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	1 51E-02	3 66E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15,000	0 0E+00	7 0E+02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 4E-02	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+03	3 24E-02	8 23E-06	3 00E+02	2 67E-03	6 15E-05	725 00	10,471	0 0E+00	2 0E+01
120821 1,2,4-Trichlorobenzene	1 79E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	482 15	7,205	0 0E+00	1 1E+02
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitroethane	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	936 00	14,370	0 0E+00	1 1E+01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	544 00	7,192	0 0E+00	3 5E+02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	516 50	6,717	0 0E+00	7 0E+02
156805 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	17,000	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	989 27	13,815	0 0E+00	1 4E+01
205992 Benzo(b)fluoranthene	1 23E+06	2 86E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	1078 24	17,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-05	839 37	13,000	4 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-07	587 38	7,000	3 7E-05	0 0E+02
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 47E-02	770 00	12,938	1 9E-04	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	482 20	11,000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	13,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	14,127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	1750 00	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	4 60E-03	873 31	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Initial
groundwater
CAS No
conc,
C_w
(μg/L)

79345 9.1

Chemical

1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T _s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L _f (cm)	ENTER Depth below grade to water table, L _{wt} (cm)	ENTER Totals must add up to value of L _{wt} (cell D28) Thickness of soil stratum A, h _A (cm)	ENTER Thickness of soil stratum B, h _B (cm)	ENTER Thickness of soil stratum C, h _C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k _v)	ENTER User-defined stratum A soil vapor permeability, k _v (cm ²)
16	15	2499.36	853.44	304.8	1341.12	C	SC	L	

ENTER Stratum A soil dry bulk density, ρ _b ^A (g/cm ³)	ENTER Stratum A soil total porosity, n ^A (unitless)	ENTER Stratum A soil water-filled porosity, θ _w ^A (cm ³ /cm ³)	ENTER Stratum B soil dry bulk density, ρ _b ^B (g/cm ³)	ENTER Stratum B soil total porosity, n ^B (unitless)	ENTER Stratum B soil water-filled porosity, θ _w ^B (cm ³ /cm ³)	ENTER Stratum C soil dry bulk density, ρ _b ^C (g/cm ³)	ENTER Stratum C soil total porosity, n ^C (unitless)	ENTER Stratum C soil water-filled porosity, θ _w ^C (cm ³ /cm ³)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space thickness, L _{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s ²)	ENTER Enclosed space length, L _g (cm)	ENTER Enclosed space width, W _g (cm)	ENTER Enclosed space height, H _g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rq} (cm^2)	Stratum A 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, $\theta_{w,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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}^{1-15} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{cz}^{eff} (cm^2/s)	Total overall effective diffusion coefficient, D_T^{eff} (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	10,480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.23E-04	2.50E-04	7.53E-04	2484.36
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vol} (cm^3/s)	Crack effective diffusion coefficient, D_{crack}^{eff} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{y}^{-1}$)	Reference conc, RIC (mg/m ³)			
15	8.36E+00	0.10	2.89E+00	2.90E-03	3.84E+02	8.15E+16	4.53E-06	3.79E-05	5.8E-05	N/A			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.11E+03	NA	1.11E+03	2.97E+06	1.11E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table							
	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)	
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	

Chemical Properties Lookup Table													
CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm·m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-yr}$)	Reference conc. RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-03	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	942.25	13,000	4.6E-03	0.0E+00
68850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.89E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromofom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	596.00	9,478	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.96E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	4 51E-07	13 723	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	839 68	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	5 00E-06	890 45	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	13 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	899 00	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 10E-06	3 23E+00	8 15E-03	12 977	0 0E+00	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	3 34E-01	2 45E-08	10 206	2 2E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-06	14 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	1 95E+03	7 48E-06	12 000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	4 83E-04	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	4 00E-09	13 000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	5 20E-03	8 661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	1 20E-06	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	3 90E-04	9 700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 80E-06	2 09E+03	2 40E-05	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	7 88E-03	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	2 76E-03	8 737	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 89E-06	7 87E+03	2 00E-06	11 329	0 0E+00	7 0E-02
108423 p-Xylene	3 89E+02	7 69E-02	7 90E-06	7 38E+01	7 66E-03	8 525	0 0E+00	0 0E+00
108467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	3 10E+02	2 43E-03	9 271	0 0E+00	8 0E-01
108478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	3 32E-07	7 643	2 6E-05	0 0E+00
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	9 78E-04	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	8 523	0 0E+00	7 0E-02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	7 34E-03	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	6 63E-03	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	3 71E-03	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	3 98E-07	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 80E-05	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 12E-05	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	2 00E-01	1 02E-07	862 22	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 40E-02	6 68E-05	15 000	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	6 51E-05	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	1 32E-05	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 42E-03	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrofluorene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	9 27E-08	8 140	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	7 83E-04	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	1 10E-05	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 07E-03	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	9 39E-03	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	1 11E-04	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	1 60E-06	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	1 11E-04	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	5 26E-06	8 00E-04	8 29E-07	969 27	5 1E-04	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	9 46E-05	10 190	2 1E-05	0 0E+00
309002 Aldrin	2 43E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	16 455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	6 97E-03	13 000	4 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	1 06E-05	839 36	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 28E-02	1 00E-05	2 80E+03	7 44E-07	13 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	1 77E-02	7 000	3 7E-05	2 0E-02
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	7 46E-07	12 938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	2 25E-06	11 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	9 51E-06	13 000	2 8E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-06	14 127	0 0E+00	3 0E-04
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 00E-03	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

cs-1,2-Dichloroethylene

156592 15 1225

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{WT} (cell D28)	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, k_v) (cm ²)
16	15	2499.36	853.44	304.8	1341.12		C	SC	L

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{rock} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
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

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.345	3.844
Source-building separation, L_T (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A 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)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)			Area of enclosed space below grade, A_g (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} (unitless)	Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	4.56E-04	1.20E-04	6.52E-04	2484.36
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)			Average vapor flow rate into bldg, Q_{soil} (cm^3/s)	Crack radius, r_{crack} (cm)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit	Reference conc., RfC			
	15	1.15E+02	0.10	2.89E+00	2.98E-03	3.84E+02	2.73E+16	3.97E-06	4.55E-04	NA	3.5E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
NA	8.02E+04	8.02E+04	3.50E+06	8.02E+04

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

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K _s (cm/hr)	α (1/cm)	N (unitless)	M (unitless)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.0092
CL	0.26	0.019	1.31	0.237	0.085
L	1.04	0.036	1.56	0.359	0.078
LS	14.59	0.124	2.28	0.561	0.040
S	29.70	0.145	2.68	0.627	0.044
SC	0.12	0.027	1.23	0.187	0.026
SCL	1.31	0.059	1.48	0.324	0.029
SI	0.25	0.016	1.37	0.270	0.034
SIC	0.02	0.005	1.09	0.083	0.0039
SICL	0.07	0.010	1.23	0.187	0.0056
SIL	0.45	0.020	1.41	0.291	0.011
SL	4.42	0.075	1.89	0.471	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H^1 (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF	Reference conc., RfC
												(μ g/m ³) ¹	(mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56563	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E+03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	8.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.1E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E+03
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	4.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75232	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	388.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.58E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-08	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+00	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	9 12E+01	7 40E-02	7 90E-06	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-08	26	411 52	616 20	8 525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	472 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	6 1E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 92E-07	25	365 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	4 01E-02	9 78E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108363 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	2 10E-02	5 12E-04	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	7 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-01	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 58E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 12E-05	25	615 18	725 00	13 121	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	488 15	720 00	10 471	0 0E+00	2 0E-01
121142 2,4-Dinitrotoluene	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
120921 1,2,4-Trichlorobenzene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 63E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	4 86E-06	1 60E-03	6 97E-03	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	5 66E-06	8 00E-04	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	4 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	53469219 Aroclor 1242 (PCB-1242)	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041060

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER
Initial
groundwater
CAS No
conc,
 C_w
(numbers only,
no dashes)
($\mu\text{g/L}$)

Chemical

56235 6 136923077

Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499.38	853.44	304.8	1341.12		C	SC	L	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_a (cm)	ENTER Enclosed space width, W_a (cm)	ENTER Enclosed space height, H_a (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., $R(C)$ (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

7041062

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_b (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_c (cm ³ /cm ³)	Stratum A total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rp} (cm ²)	Stratum A 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_{seam} (cm)
9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7,798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	1.12E-04	6.75E-04	2484.36

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., $Q_{v,bldg}$ (cm ³ /s)	Crack effective diffusion coefficient, D^{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, exp(Pe ^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	8.53E+02	0.10	2.89E+00	3.16E-03	3.84E+02	3.32E+15	4.10E-06	3.50E-03	1.5E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
4.64E+01	NA	4.64E+01	7.93E+05	4.64E+01

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

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°C)	Critical temperature, T_c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc. RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.78E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56555	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65950	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDO	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-01	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromofom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78991	Isophorone	4.68E+01	6.23E-02	7.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 00	12,000	3 4E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	754 00	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 00	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 80	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 00E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E-03
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 08E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 80	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-07	3 32E-05	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E-02
108962 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 58E-04	1 12E-05	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15,999	4 0E-06	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	825 00	14,447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	2 96E+04	3 24E-02	8 23E-06	3 00E+02	2 67E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 79E+03	3 00E-02	8 77E-06	4 50E+03	8 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dinitrotoluene	9 55E+01	3 48E-02	7 06E-06	2 70E+02	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
124481 Chlorodibromomethane	6 31E+01	2 03E-01	1 05E-05	2 60E+03	3 21E-02	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	678 20	8,000	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	938 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	839 37	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 36	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	4 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13,000	0 0E+00	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

7041066

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒

OR

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

YES ☐

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

71432 2 217692308

Chemical

Benzene

ENTER Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)
16	15	2499.36	853.44	304.8	1341.12	C	SC	L

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc , RfC (mg/m ³)
8.80E-02	9.80E-06	5.56E-03	25	7.342	353.24	562.16	5.89E+01	1.75E+03	8.3E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rp} (cm ²)	Stratum A 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)
9.46E+08	2484.36	0.230	0.150	0.130	0.347	3.89E-09	0.778	3.03E-09	30.00	0.43	0.084	0.346	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.061	3.64E-03	1.53E-01	1.77E-04	3.57E-03	9.05E-04	5.40E-04	1.35E-04	7.71E-04	2484.36
Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{rad} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack}^{eff} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RIC (mg/m ³)			
15	1.53E+02	0.10	2.89E+00	3.57E-03	3.84E+02	5.65E+13	4.63E-06	7.10E-04	8.3E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
4.13E+02	NA	4.13E+02	1.75E+06	4.13E+02

INCREMENTAL RISK CALCULATIONS.

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

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

LOOKUP TABLES

SCS Soil Type	K_a (cm/h)	α (1/cm)	N (unitless)	D_a (cm ² /s)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.0092	0.0088								
CL	0.26	0.019	1.31	0.237	0.41	0.016									
L	1.04	0.036	1.56	0.359	0.43	0.020									
LS	14.59	0.124	2.28	0.561	0.41	0.040									
S	29.70	0.145	2.68	0.627	0.43	0.044									
SC	0.12	0.027	1.23	0.187	0.38	0.025									
SCL	1.31	0.059	1.48	0.324	0.39	0.029									
SI	0.25	0.016	1.37	0.270	0.46	0.034									
SIC	0.02	0.005	1.09	0.083	0.26	0.0039									
SIL	0.07	0.010	1.23	0.187	0.43	0.0056									
SIL	0.45	0.020	1.41	0.291	0.45	0.011									
SL	4.42	0.075	1.89	0.471	0.41	0.030									

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-04	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
80571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
56850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.56E-03	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	1.72E-02	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	313.00	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.7E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.10E-03	25	319.00	467.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-02	1.03E-05	1.19E+03	2.19E-02	5.34E-04	25	422.35	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.06E-05	3.10E+03	2.19E-02	5.34E-04	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	303.69	546.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E+00	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	4.22E-01	25	360.36	544.20	7,505	1.7E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,998	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03		25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 38E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	7 78E-06	25	519 15	749 03	12,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 48E-08	25	582 15	813 20	10,373	0 0E+00	1 4E-01
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+00	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 28	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	9 12E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	3 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	1 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95854 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	3 89E+02	5 84E-02	8 89E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	7 76E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	411 52	684 75	8,525	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+01	4 83E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	1 04E-01	9 90E-06	5 30E+03	1 36E-05	3 32E-07	25	358 65	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	2 00E-06	8 52E+03	4 01E-02	9 78E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	4 07E+02	7 00E-02	7 80E-06	2 00E+04	2 10E-02	5 12E-04	25	617 05	806 00	8,523	0 0E+00	7 0E+00
108383 m-Xylene	1 82E+02	8 70E-02	8 60E-06	1 61E+02	3 01E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108883 Toluene	2 19E+02	7 30E-02	8 70E-06	5 26E+02	2 72E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 88E+01	8 20E-02	9 10E-06	4 72E+02	1 52E-01	3 71E-03	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	8 28E+04	1 63E-05	3 98E-07	25	452 02	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	482 15	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	725 00	11,000	0 0E+00	1 1E-02
121448 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E-02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 58E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	5 56E-06	8 00E-04	3 40E-05	9 46E-05	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-03	3 88E-03	1 61E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 08E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	6 06E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodip-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 58E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041072

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

79016 6 890769231

Trichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{wt} (cell D28)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1371.6	548.64	548.64	274.32		C	S	SI

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{rack} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_b (cm)	Enclosed space floor width, W_b (cm)	Enclosed space height, H_b (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based
groundwater concentration

100

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
9.48E+08	1356.6	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg. ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^z (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
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5 63E+04	9 24E+05	4 16E-04	15	8 483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	9 63E-04	1356 6
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{inlet} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of foundation coefficient, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
15	2 78E+02	0 10	6 67E-01	3 20E+03	3 84E+02	3 39E+03	5 87E-06	1 63E-03	1 7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
8.77E+02	NA	8.77E+02	1.10E+06	8.77E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.28	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{ow} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{vs} (cal/mol)	Unit risk factor, UR _F (μg/m ³) ¹	Reference conc. R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51002	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.47E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55553	Benz(a)anthracene	3.98E+06	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	1.99E-03	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.6E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72558	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	487.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+03	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromodorm	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.88E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.68	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	620.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	681.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-08	1 12E+01	3 85E-08	1 12E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	7 55E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87583 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 25E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88067 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	5 90E-02	5 90E-02	7 50E-06	3 10E+01	1 89E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	25	560 28	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 80E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107652 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	358 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 40E-02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 58E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 11E-04	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 60E-06	25	714 15	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 81E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-04	1 70E-04	25	603 01	835 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 36E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	5 42E+01	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E-02
542756 1,3-Dichloropropene	6 06E+02	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	8 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	25	509 60	746 87	11 000	2 0E-03	0 0E+00
621547 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	613 96	848 76	13 000	2 8E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	8 00E-06	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-01	1 89E-01	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

127184 1 720769231

Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1371.6	548.64	548.64	274.32		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$)	Reference conc., RIC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8.288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1356.6	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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)	
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} (unitless)	Henry's law constant at ave groundwater temperature, μ_{TS} (g/cm-s)	Vapor viscosity at ave soil temperature, D^{eff}_A (cm^2/s)	Stratum A effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_C (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_T (cm^2/s)	Total overall effective diffusion coefficient, L_d (cm)	Diffusion path length, 1356.6 (cm)	
	5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	5.05E-04	8.77E-04	1356.6
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, $Q_{v,bldg}$ (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)				
	15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.46E+03	5.59E-06	2.63E-03	5.8E-07	N/A			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc. (µg/L)	Indoor exposure groundwater conc. (µg/L)	Risk-based indoor exposure groundwater conc. (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc. (µg/L)
1.59E+03	NA	1.59E+03	2.00E+05	1.59E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0082
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DOT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.78E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoc Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-02	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	5.50E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
76448	Heptachlor	1.41E+06	1.12E-02	5.89E-06	1.04E-05	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.59E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	389.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	366.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-08	1 08E+03	1 85E-05	4 51E-07	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	839 68	0 0E+00	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	13 000	1 4E-06	0 0E+00
87448 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	12 666	0 0E+00	1 4E-01
87683 Hexachloro-1,3-bisuladiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 13E-08	13 977	5 7E-06	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	10 206	2 2E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	813 20	3 1E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	2 44E-08	14 000	3 1E-05	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	12 000	3 1E-05	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	10 373	0 0E+00	1 4E-01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	5 20E-03	754 03	1 3E-04	0 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-06	8 661	0 0E+00	7 0E+00
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	1 90E-03	10 800	0 0E+00	1 8E-01
95584 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	9 700	0 0E+00	2 0E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	9 572	0 0E+00	1 8E-02
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	13 000	0 0E+00	3 5E-01
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	10 566	0 0E+00	2 0E-03
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	719 00	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	8 501	0 0E+00	1 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	8 737	0 0E+00	7 0E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	2 43E-03	8 525	0 0E+00	8 0E-01
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	11 689	0 0E+00	1 4E-02
108054 Vinyl acetate	5 28E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	7 643	2 8E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	7 30E+02	8 70E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+02	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	6 68E-05	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 02E-07	806 00	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	882 22	0 0E+00	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	14 447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	13 121	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	10 471	0 0E+00	2 0E-01
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	708 17	0 0E+00	1 1E-02
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	814 00	0 0E+00	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	678 20	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	14 370	0 0E+00	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	7 192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	6 717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 60E-06	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 11E-04	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	8 00E-04	3 40E-05	8 29E-07	16 000	2 1E-05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	9 46E-05	16 455	2 1E-06	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 70E-04	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 70E-04	13 000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	5 47E+01	6 26E-02	7 34E-06	2 00E+00	4 35E-04	1 70E-04	13 000	4 9E-03	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 05E-05	7 77E-02	13 000	5 3E-04	0 0E+00
608202 2,6-Dinitrotoluene	3 27E+02	1 00E-05	2 80E+03	7 26E-01	3 05E-05	1 77E-02	7 000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	3 06E-05	7 46E-07	12 938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	11 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	13 000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	14 127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

1,1-Dichloroethylene

75354 16 67692308

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)
16	15	1371.6	548.64	548.64	274.32	C	SI

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

15 40 961 961 488 0.1 0.45

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, ATc (yrs)	Averaging time for noncarcinogens, ATnc (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for carcinogens, TR (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-08	1

70	30	30	350	1.0E-08	1
Used to calculate risk-based groundwater concentration					

CHEMICAL PROPERTIES SHEET

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
9.00E-02	1.04E-05	2.61E-02	25	6,247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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)	
9.46E+08	1356.6	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.294	3.844	
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_B (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)	
	5.63E+04	9.24E+05	4.16E-04	15	6.353	1.87E-02	7.88E-01	1.77E-04	3.65E-03	9.22E-04	5.47E-04	6.30E-04	1.09E-03
Convection path length, L_p (cm)	Source vapor conc, C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{total} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc, RfC (mg/m ³)			
15	7.88E+02	0.10	6.67E-01	3.65E-03	3.84E+02	1.26E+03	6.25E-06	4.92E-03	5.0E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc. ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc. ($\mu\text{g/L}$)
9.88E+00	NA	9.88E+00	2.25E+06	9.88E+00

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant		Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
						Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)						
50293	DDT	2.63E+08	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.4E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.69E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.80E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	861.15	8,996	5.8E-05	0.0E+00
83328	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	4.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	7 5E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 88E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	3 37E+04	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+00	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 10E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	7 90E-06	1 58E+02	7 79E-02	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	2 60E+04	4 92E-05	3 90E-04	25	447 53	675 00	9 572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	2 43E-03	25	526 15	759 13	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	483 95	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	9 84E-04	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	7 87E+03	8 20E-05	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	1 85E+02	3 14E-01	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	2 09E+02	5 84E-02	8 69E-06	3 10E+02	1 13E-01	2 43E-03	25	411 52	616 20	8 525	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	7 38E+01	9 86E-02	7 66E-03	25	447 21	684 75	9 271	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	7 90E-06	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	1 01E-05	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 843	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 62E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	894 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	482 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	416 14	678 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	687 95	936 00	14 370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	665 95	905 00	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	8 21E-06	1 60E-03	3 88E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	7 46E-07	25	509 60	746 87	11 000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	8 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	8 61E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	1 14E-02	25	657 15	873 31	14 000	3 2E-04	0 0E+00
7439978 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	25	402 50	538 37	19 000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	8 00E-02	1 89E-01	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					
53469219 Aroclor 1242 (PCB-1242)												

7041090

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

87663 2 633076923

Chloroform

ENTER Average groundwater temperature, T_g ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)
16	15	1706.88	579.12	152.4	975.36		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	0.42	0.27	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_s (cm)	ENTER Enclosed space width, W_s (cm)	ENTER Enclosed space height, H_s (cm)	ENTER Floor crack seam width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RIC (mg/m^3)
1.04E-01	1.00E-05	3.68E-03	25	6.988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{te} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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, θ_a^{cz} (cm ³ /cm ³)	Water-filled porosity in capillary zone, θ_w^{cz} (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	1891.88	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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} (unitless)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.492	1.04E-01	1.77E-04	1.77E-04	4.22E-03	1.07E-03	6.40E-04	7.36E-04	9.41E-04	1691.88
Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{tot} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (µg/m ³)	Reference conc., RIC (mg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹				
15	1.04E+02	0.10	6.67E-01	4.22E-03	4.80E+02	5.16E-06	5.37E-04	NA	2.3E-05				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.97E+02	NA	1.97E+02	7.92E+06	1.97E+02

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc. RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
692E+00	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
589E+01	Benzene	5.89E+01	8.80E-02	9.80E-06	1.78E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	636.44	860.38	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.69E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	4.22E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 39E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-05	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	789 00	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	7 79E-02	1 20E-06	697 60	9,700	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	1 60E-02	3 90E-04	705 00	9,572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	675 00	10,566	0 0E+00	1 8E-01
95584 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	719 00	8,501	0 0E+00	1 0E+00
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	617 20	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	707 60	11,329	0 0E+00	7 0E-02
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	616 20	8,525	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	636 00	8,737	0 0E+00	1 0E+00
105423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	707 60	11,329	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 12E-05	942 94	14,000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 58E-04	1 02E-07	865 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	5 41E-02	6 88E-05	882 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14,447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	7 74E-06	2 00E-02	2 67E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 04E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	1 60E-06	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzofluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	3 40E-05	1 61E-05	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	5 58E-06	1 50E+03	4 55E-03	1 11E-04	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	3 40E-05	1 61E-05	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	8 29E-07	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	744 07	7,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	7 34E-06	2 40E+01	3 05E-05	7 44E-07	770 00	12,938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	2 80E+03	7 26E-01	1 77E-02	746 87	11,000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	8 32E+04	1 32E-02	4 23E-06	2 00E+01	9 23E-05	2 25E-06	848 78	13,000	2 6E-03	0 0E+00
621647 N-Nitrosodiphenylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-08	1750 00	14,127	0 0E+00	3 0E-04
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E+01	9 23E-05	9 51E-08	873 31	14,000	3 2E-04	0 0E+00
7439978 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	539 37	19,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	4 60E-03	512 27	19,000	1 0E-04	0 0E+00
11098825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	475 22	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	482 20	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04				
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04				

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

79016

2 088461538

Trichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm^2)
16	15	1706.88	579.12	152.4	975.36	C	Si

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{rock} (cm)	Enclosed space floor length, L_s (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Soil stratum C directly above water table, (Enter A, B, or C)	Soil stratum C soil type (used to estimate soil vapor permeability, k_v) (cm^2)
15	40	961	961	488	0.1	0.45	0.3

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., $R(C)$ (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1691.88	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H'_{ts} (unitless)	Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)	Stratum A soil relative permeability, k_g (cm^2)	Stratum A 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)
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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 number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Stratum A effective diffusion coefficient, $D_{\text{eff},A}$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{\text{eff},B}$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{\text{eff},C}$ (cm^2/s)	Capillary zone effective diffusion coefficient, $D_{\text{eff},cz}$ (cm^2/s)	Total overall effective diffusion coefficient, $D_{\text{eff},T}$ (cm^2/s)	Diffusion path length, L_d (cm)	
15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	4.35E-06	1.21E-03	1.7E-06	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
1.18E+03	NA	1.18E+03	1.10E+06	1.18E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _r (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E+02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
68850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67683	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	353.24	562.16	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	374.24	545.00	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	639.90	863.77	13,000	9.7E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.70E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.87E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.80E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.6E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.56E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-05	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	2 61E+00	2 61E-03	6 37E-06	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	580 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	447 53	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	526 15	759 13	13,000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	2 91E-02	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	483 95	719 00	10,566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	439 34	617 20	8,501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	636 00	8,737	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	3 14E-01	7 66E-03	25	411 52	616 20	8,525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	9 98E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 8E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 28E+00	8 50E-02	9 20E-06	2 00E+04	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 53E+01	6 92E-02	7 53E-06	1 72E+04	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 51E-02	4 58E-06	5 10E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	5 41E-02	6 68E-05	25	704 09	882 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 32E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+03	3 24E-02	7 74E-06	4 34E-02	5 82E-02	1 42E-03	25	482 15	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	3 80E-06	3 17E-06	25	590 00	814 00	13,467	1 9E-04	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 21E-02	9 27E-08	25	416 14	678 20	8,000	2 4E-05	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	7 54E-01	7 83E-04	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 01E-02	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	4 07E-03	25	333 85	544 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	17,000	2 1E-04	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	9 39E-03	25	320 85	516 50	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+08	1 90E-02	5 66E-06	2 20E-05	6 66E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 20E-05	6 66E-05	1 60E-06	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	25	381 15	587 38	7,000	3 7E-05	2 0E-02
60202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 48E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E+01	3 90E-04	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	1 14E-02	1 14E-02	25	629 88	1750 88	14,127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 80E+05	1 38E-02	4 32E-06	8 00E-02	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041102

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Initial
groundwater
CAS No
conc.
(numbers only,
 C_w
no dashes)
($\mu\text{g/L}$)

Chemical

127184 2.570769231

Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2)
16	15	1708.88	579.12	152.4	975.36	C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1007

CHEMICAL PROPERTIES SHEET

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, $\Delta H_{v,a}$ (cal/mol)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1691.88	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam permeability, X_{crack} (cm)
Bldg ventilation rate, Q_{building} (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm^2/s)	Total effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	5.05E-04	6.45E-04	1691.88
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)		Average vapor flow rate into bldg, Q_{soil} (cm^3/s)	Crack radius, r_{crack} (cm)		Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, C_{building} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-}^{-1}$)	Reference conc., RIC (mg/m ³)			
15	4.71E+02	0.10	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	4.09E-06	1.93E-03	5.8E-07	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
2.18E+03	NA	2.18E+03	2.00E+05	2.18E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D_e (cm ² /s)	D_w (cm ² /s)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.098	0.0092		
CL	0.26	0.019	1.31	0.237	0.41	0.065	0.016		
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020		
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040		
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044		
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025		
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029		
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046		
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039		
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056		
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011		
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030		

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, UR ¹ (μg/m ³) ¹	Reference conc, R ¹ C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	566.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E+01
67683	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	695.00	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	8.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.66E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	380.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84562 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0.0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0.0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	680 60	839 68	13,000	0.0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1.4E-06	0.0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0.0E+00	1.4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5.7E-06	0.0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2.2E-05	0.0E+00
87865 Pentachlorophenol	9 92E+02	5 60E-02	6 10E-06	1 95E+03	3 19E-04	2 44E-08	25	582 15	813 20	14,000	3.4E-05	0.0E+00
88062 2,4,6-Trichlorophenol	3 81E-02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3.1E-06	0.0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0.0E+00	1.4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	25	560 26	754 03	13,000	1.3E-04	0.0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	4 92E-05	5 20E-03	25	417 60	630 30	8,661	0.0E+00	7.0E+00
95487 2-Methylphenol (o-cresol)	6 17E+01	7 40E-02	8 30E-06	1 58E+02	7 79E-02	1 20E-06	25	464 19	697 60	10,800	0.0E+00	1.8E-01
95501 1,2-Dichlorobenzene	9 12E+02	6 90E-02	7 90E-06	2 20E+04	1 80E-02	1 90E-03	25	453 57	705 00	9,700	0.0E+00	2.0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+03	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0.0E+00	3.5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0.0E+00	2.0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	3 23E-01	7 88E-03	7 88E-03	25	409 34	617 20	8,501	0.0E+00	1.0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0.0E+00	1.0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	616 20	11,329	0.0E+00	7.0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8,525	0.0E+00	7.0E-02
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0.0E+00	8.0E-01
107082 1,2-Dichloroethane	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0.0E+00	1.4E-02
174E+01	1 04E-01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	345 65	519 13	7,800	0.0E+00	2.0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	356 65	561 00	7,643	2.6E-05	0.0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	1 80E-05	25	451 15	659 79	9,000	0.0E+00	2.1E-02
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	412 27	617 05	8,523	0.0E+00	7.0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0.0E+00	2.0E-02
111444 Bis(2-chloroethyl)ether	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0.0E+00	2.1E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 80E-05	25	674 43	859 94	9,000	0.0E+00	2.1E-02
117817 Bis(2-ethoxyethyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4.0E-06	0.0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0.0E+00	7.0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	615 18	825 00	14,447	4.6E-04	0.0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 32E-05	25	582 55	812 00	13,121	0.0E+00	1.1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0.0E+00	2.0E-01
121142 2,4-Dinitrophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0.0E+00	1.1E-02
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0.0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2.4E-05	0.0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5.8E-07	0.0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	1 10E-05	25	667 95	936 00	14,370	0.0E+00	1.1E-01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	25	320 85	518 50	6,717	0.0E+00	3.5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	9 39E-03	25	809 15	1078 24	17,000	2.1E-04	0.0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 53E-03	1 11E-04	25	715 90	969 27	15,000	2.1E-04	0.0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,615	0.0E+00	1.4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2.1E-05	0.0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2.1E-06	0.0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4.9E-03	0.0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1.8E-03	0.0E+00
319857 beta-HCH (beta-BHC)	1 28E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	5.3E-04	0.0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	25	381 15	587 38	7,000	3.7E-05	2.0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	12,938	1.9E-04	0.0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	2 25E-06	2 25E-06	25	509 60	746 87	11,000	2.0E-03	0.0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2.6E-03	0.0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 82E-02	4 67E-01	6 00E-06	25	629 88	1750 00	14,127	0.0E+00	3.0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	4 80E-03	25	657 15	873 31	14,000	3.2E-04	0.0E+00
11096325 Aroclor 1280 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1.0E-04	0.0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1.0E-04	0.0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1.0E-04	0.0E+00
5349219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1.0E-04	0.0E+00

7041108

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

Chemical CAS No (numbers only, no dashes)

Chemical

56235 2 938461538

Carbon tetrachloride

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{wt} (cell D28)	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, k_v) (cm ²)
16	15	1706.88	579.12	152.4	975.36		C	S	SI

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil water-filled porosity, θ_w^A (unitless)	Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{fack} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_f (cm)	Enclosed space floor width, W_f (cm)	Enclosed space height, H_b (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45	0.45	0.45	0.45

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

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

7041110

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{gr} (cm ²)	Stratum A 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 penetrometer, X_{crack} (cm)
9.46E+08	1691.88	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{venting}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	5.46E-04	6.98E-04	1691.88

Convection path length, L_p (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., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
15	8.53E+02	0.10	6.67E-01	3.16E-03	3.84E+02	3.77E+03	4.31E-06	3.67E-03	1.5E-05	NA

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)
4.42E+01	NA	4.42E+01	7.93E+05	4.42E+01	NA	NA

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D_a (cm ² /s)	D_w (cm ² /s)	S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature H (atm-m ³ /mol)	Henry's law constant reference temperature T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092								
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016								
IL	1.04	0.036	1.56	0.359	0.43	0.078	0.020								
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040								
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044								
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025								
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029								
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046								
SIC	0.02	0.005	1.09	0.083	0.28	0.070	0.0039								
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056								
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011								
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030								

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature H (atm-m ³ /mol)	Henry's law constant reference temperature T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	4.63E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.00E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
58553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E+01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	583.05	10,348	0.0E+00	3.5E+01
71432	Benzene	5.89E+01	8.00E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.18	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.71E-02	25	276.71	487.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-05	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.71E-02	25	319.00	522.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1,2-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	6.261E-02	25	304.75	576.00	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79018	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	681.15	8,995	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03							

VLOOKUP TABLES

84662 Diethylphthalate	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	7 03E-06	7 03E+00	6 26E-07	7 48E-08	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	6 16E-06	3 23E+00	3 34E-01	1 53E-08	899 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	1 95E+03	1 00E-06	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	8 00E-06	3 10E-01	2 44E-08	813 20	14 000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	1 98E-02	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	3 10E+01	1 84E-07	4 83E-04	748 40	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	2 60E+04	4 82E-05	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	1 56E+02	7 79E-02	1 20E-06	697 60	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	1 60E-02	3 90E-04	705 00	9 572	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	1 20E+03	1 78E-04	4 34E-06	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	3 10E+02	1 13E-01	2 76E-03	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	7 87E+03	8 20E-05	2 00E-06	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	1 85E+02	3 14E-01	7 68E-03	618 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	9 98E-02	2 43E-03	684 75	9 271	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	1 36E-05	3 32E-07	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	4 01E-02	9 78E-04	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	2 00E+04	2 10E-02	5 12E-04	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	1 61E+02	3 01E-01	7 34E-03	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	5 26E+02	2 72E-01	6 63E-03	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	4 72E+02	1 52E-01	3 71E-03	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	8 28E+04	1 63E-05	3 98E-07	694 20	10 920	0 0E+00	2 1E-00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	1 72E-04	7 38E-04	1 80E-05	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	5 10E-01	4 59E-04	1 12E-05	642 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 40E-01	4 18E-06	1 02E-07	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	5 15E-02	2 00E-02	2 74E-03	6 68E-05	862 22	15 000	0 0E+00	7 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	6 20E+00	5 41E-02	1 32E-05	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	6 51E-05	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	3 00E+02	5 82E-02	1 42E-03	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	4 50E+03	1 30E-04	3 17E-06	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	3 80E-06	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	7 83E-04	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	2 00E+02	7 54E-01	1 84E-02	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	4 51E-04	1 10E-05	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 58E+01	7 38E-02	1 13E-05	3 50E+03	9 39E-03	516 50	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	4 07E-03	544 00	7 192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+08	2 26E-02	5 56E-06	2 06E-01	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	1 61E-05	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	8 29E-07	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	9 46E-05	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	1 06E-05	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	7 44E-07	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	1 77E-02	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 51E-06	848 76	13 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	8 20E-02	2 00E-03	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	475 22	18 000	1 0E+00	0 0E+00
53468219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
2.98E-02	1.06E-05	1.60E-03	25	7,000	363.15	585.85	5.50E+01	6.74E+03	1.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, $\theta_{a,A}$ (cm^3/cm^3)	Stratum B air-filled porosity, $\theta_{a,B}$ (cm^3/cm^3)	Stratum C air-filled porosity, $\theta_{a,C}$ (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{se} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	1691.88	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg. ventilation rate, Q_{bldg}	Area of enclosed space below grade, A_g	Crack-to-total area ratio, η	Crack depth below grade, Z_{crack}	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,ts}$	Henry's law constant at ave. groundwater temperature, H'_{ts}	Vapor viscosity at ave soil temperature, μ_{ts}	Stratum A effective diffusion coefficient, D^{eff}_A	Stratum B effective diffusion coefficient, D^{eff}_B	Stratum C effective diffusion coefficient, D^{eff}_C	Capillary zone effective diffusion coefficient, D^{eff}_{ca}	Total overall effective diffusion coefficient, D^{eff}_T	Diffusion path length, L_d
(cm^3/s)	(cm^2)	(unitless)	(cm)	(cal/mol)	(atm-m ³ /mol)	(g/cm-s)	(cm^2/s)	(cm^2/s)	(cm^2/s)	(cm^2/s)	(cm^2/s)	(cm)
5.63E+04	9.24E+05	4.16E-04	15	7.723	1.07E-03	4.49E-02	1.77E-04	1.21E-03	3.22E-04	2.04E-04	2.30E-04	2.96E-04

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., $Q_{v,bldg}$ (cm^3/s)	Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC ($\mu\text{g}/\text{m}^3$)
15	4.49E+01	0.10	6.67E-01	1.21E-03	3.84E+02	2.07E+09	2.31E-06	1.04E-04	1.8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.30E+03	NA	1.30E+03	6.74E+06	1.30E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.0092
CL	0.26	0.019	1.31	0.237	0.016
L	1.04	0.036	1.56	0.359	0.078
LS	14.59	0.124	2.26	0.561	0.040
S	29.70	0.145	2.68	0.627	0.044
SC	0.12	0.027	1.23	0.187	0.025
SCL	1.31	0.059	1.48	0.324	0.029
SI	0.25	0.016	1.37	0.270	0.046
SIC	0.02	0.005	1.09	0.083	0.0039
SIL	0.07	0.010	1.23	0.187	0.0056
SIL	0.45	0.020	1.41	0.291	0.011
SL	4.42	0.075	1.89	0.471	0.030

Chemical Properties Lookup Table											
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ² /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ^o (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.47E-07	25	605.28	827.85	15,000
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.44E-08	25	743.24	990.41	16,000
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.84E-06	25	708.15	1004.79	15,000
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000
66850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346
71432	Benzene	5.88E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-02	25	353.24	562.16	7,342
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.80E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000
74839	Methyl bromide	1.09E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714
75014	Vinyl chloride (chloroethene)	1.88E+01	1.06E-01	1.23E-05	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250
75092	Methylene chloride	1.77E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	698.00	6,979
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	604.75	576.05	6,247
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.83E-06	25	488.35	715.00	10,271
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322
79016	Trichloroethylene	1.68E+01	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-02	25	360.36	544.20	7,505
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.90E-02	7.90E-06	2.97E+03	1.41E-02	1.03E-04	25	419.60	561.15	8,996
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-05	890 45	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	879 00	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	10 206	2 2E-05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	4 34E-06	9 572	0 0E+00	1 8E-02
98954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 80E-06	2 09E+03	9 84E-04	4 34E-06	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	11 329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	8 525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	7 070	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	6 84 75	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	5 19 13	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-01	7 53E-06	1 72E+04	4 59E-04	1 12E-05	14 000	0 0E+00	2 1E-02
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 18E-06	1 02E-07	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	862 22	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	8 51E-05	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 98E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	4 12E-05	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	7 25 00	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	8 288	5 8E-07	0 0E+00
129000 Pyrene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 51E-04	1 10E-05	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	5 16 50	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	2 26E-02	5 58E-06	2 20E-05	6 56E-05	9 39E-03	7 192	0 0E+00	3 5E-02
205592 Benzo(b)fluoranthene	1 23E+06	3 02E-02	6 35E-06	2 06E-01	4 53E-03	1 60E-06	10 78 24	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	5 58E-06	8 00E-04	4 53E-03	1 60E-06	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	4 53E-03	1 60E-06	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	13 000	2 6E-03	0 0E+00
743976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	14 127	0 0E+00	3 0E-04
800135 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	19 000	1 0E-04	0 0E+00
11097891 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☒ X

OR

YES ☐

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

75354 2.295

1,1-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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)
16	15	2804.16	243.84	274.32	2286	C	S	SC

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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

Used to calculate risk-based
groundwater concentration

7041120

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
9.00E-02	1.04E-05	2.61E-02	25	6,247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_{sA} (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_{sB} (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_{sC} (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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, $\theta_{s,cz}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm ³ /cm ³)	Floor-wall seam penmeter, X_{crack} (cm)
9.46E+08	2789.16	0.230	0.150	0.130	0.303	4.49E-10	0.834	3.75E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, Q_{bldg} (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, H^*_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	6.353	1.87E-02	7.88E-01	1.77E-04	3.65E-03	9.22E-04	5.47E-04	6.30E-04	6.15E-04	2789.16

Convection path length, L_p (cm)	Source vapor conc, C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, $Q_{v,bldg}$ (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, C_{bldg} (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc, RfC (mg/m ³)
15	7.88E+02	0.10	3.58E-01	3.65E-03	3.84E+02	4.62E+01	2.32E-06	1.83E-03	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
2.66E+01	NA	2.66E+01	2.25E+06	2.66E+01

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

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _a (cm ² /s)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095
L	1.04	0.036	1.56	0.359	0.43	0.078
LS	14.59	0.124	2.28	0.581	0.41	0.057
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.48E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.81E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.61E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	1.64E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDO	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+06
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,995	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0.0E+00	2.8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0.0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-00	25	660 60	839 68	13,000	0.0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1.4E-06	0.0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0.0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	6 28E-07	25	627 87	899 00	13,977	5.7E-06	0.0E+00
87683 Hexachloro-1,3-butadiene	5 92E+02	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2.2E-05	0.0E+00
87865 Pentachlorophenol	3 81E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	12,000	3.4E-05	0.0E+00
88062 2,4,6-Trichlorophenol	2 00E+03	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3.1E-06	0.0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0.0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1.3E-04	0.0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0.0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	484 19	697 60	10,800	0.0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0.0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0.0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0.0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0.0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0.0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0.0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0.0E+00	7 0E-02
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	25	447 21	684 75	9,271	0.0E+00	8 0E-01
107062 1,2-Dichloroethane	1 74E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0.0E+00	1 4E-02
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	561 00	7,643	2.6E-05	0.0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0.0E+00	7 0E+00
108983 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0.0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0.0E+00	2 0E-02
108952 Phenol	2 88E+01	6 92E-02	7 53E-06	1 72E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0.0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	1 15E-02	4 58E-06	5 10E-01	4 59E-04	1 12E-05	25	451 15	659 79	9,000	3.3E-04	0.0E+00
115297 Endosulfan	2 14E+03	1 51E-02	3 68E-06	2 00E-02	4 18E-06	1 02E-07	25	674 43	942 94	14,000	0.0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	8 32E+07	3 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0.0E+00	0.0E+00
117840 Di-n-octyl phthalate	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	15,000	0.0E+00	7 0E-02
118741 Hexachlorobenzene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	14,447	4.6E-04	0.0E+00
120127 Anthracene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	13,121	0.0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0.0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0.0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2.4E-05	0.0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5.8E-07	0.0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0.0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0.0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0.0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2.1E-04	0.0E+00
205992 Benzobifluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	25	655 95	905 00	13,815	0.0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	753 15	1019 70	16,000	2.1E-05	0.0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	25	714 15	979 00	16,455	2.1E-06	0.0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	25	603 01	839 37	13,000	4.9E-03	0.0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	596 55	839 36	13,000	1.8E-03	0.0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	5.3E-04	0.0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5.3E-04	0.0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3.7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1.9E-04	0.0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2.0E-03	0.0E+00
624573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2.6E-03	0.0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 87E-01	1 14E-02	25	629 88	1750 00	14,127	0.0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3.2E-04	0.0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1.0E-04	0.0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1.0E-04	0.0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1.0E-04	0.0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1.0E-04	0.0E+00

DATA ENTRY SHEET

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

YES

X

OR

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

YES

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Chemical CAS No (numbers only, no dashes)		Initial groundwater conc, C_w ($\mu\text{g/L}$)		Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade to bottom of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Totals must add up to value of L_{wt} (cell D28)		User-defined stratum A soil vapor permeability, k_v (cm^2)	
79345		2 234285714								1,1,2,2-Tetrachloroethane			
16		15		1615.44		609.6		152.4		853.44		SIC	
ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade to bottom of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Thickness of soil stratum A, h_A (cm)		Thickness of soil stratum B, h_B (cm)		Thickness of soil stratum C, h_C (cm)		Soil stratum directly above water table, (Enter A, B, or C)	
												Soil stratum A SCS soil type (used to estimate soil vapor permeability)	
												Soil stratum A SCS soil type (used to estimate soil vapor permeability)	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)		Stratum A soil total porosity, n^A (unitless)		Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		Stratum B soil dry bulk density, ρ_s^B (g/cm^3)		Stratum B soil total porosity, n^B (unitless)		Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		Stratum C soil total porosity, n^C (unitless)	
15		0.43		0.2		1.7		0.42		0.27		0.43	
ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)		Stratum A soil total porosity, n^A (unitless)		Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		Stratum B soil dry bulk density, ρ_s^B (g/cm^3)		Stratum B soil total porosity, n^B (unitless)		Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		Stratum C soil total porosity, n^C (unitless)	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{enc} (cm)		Soil-bldg pressure differential, ΔP (g/cm^2)		Enclosed space floor length, L_g (cm)		Enclosed space floor width, W_g (cm)		Enclosed space height, H_g (cm)		Floor-wall seam crack width, w (cm)		Indoor air exchange rate, ER (1/h)	
15		40		961		961		488		0.1		0.45	
ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{enc} (cm)		Soil-bldg pressure differential, ΔP (g/cm^2)		Enclosed space floor length, L_g (cm)		Enclosed space floor width, W_g (cm)		Enclosed space height, H_g (cm)		Floor-wall seam crack width, w (cm)		Indoor air exchange rate, ER (1/h)	

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

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^\circ\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^\circ\text{K}$)	Critical temperature, T_c ($^\circ\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8,996	419.80	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (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)
9.46E+08	1600.44	0.230	0.150	0.130	0.361	7.49E-11	0.799	5.99E-11	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	10,480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.23E-04	5.83E-04	7.90E-04	1600.44
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vol} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-s}^{-1}$)	Reference conc., RfC (mg/m^3)			
15	8.36E+00	0.10	5.72E-02	2.90E-03	3.84E+02	2.16E+00	1.53E-06	1.28E-05	5.8E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
3.27E+03	NA	3.27E+03	2.97E+06	3.27E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.58	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+08	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-06	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.0E+00
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	8.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.0E+00
72548	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.78E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	4.8E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	746.00	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.83E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 66E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 88	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	1 98E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 1E-06	0 0E+00
89082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E-02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	0 0E+00	0 0E+00
93476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-03	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	8 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	632 40	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	3 3E-04	0 0E+00
11444 Bis(2-chloroethyl)ether	1 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	825 00	14,447	4 8E-04	0 0E+00
115297 Endosulfan	1 78E+07	3 51E-02	3 58E-06	2 00E-02	2 74E-03	1 02E-07	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 40E-01	4 18E-06	6 88E-05	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	5 82E-05	825 00	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	7 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 05E+05	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	3 55E+01	7 35E-02	1 13E-05	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	1 60E-06	1078 24	17,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 75E+06	2 28E-02	6 35E-06	1 50E+03	4 55E-03	1 11E-04	989 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 07E+05	3 02E-02	8 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	2 48E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 77E-04	839 37	13,000	4 8E-03	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	5 3E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 28E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	596 55	7,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-04	587 38	7,000	3 7E-05	2 0E-02
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	770 00	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrodiene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11,000	2 0E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

7041132

DATA ENTRY SHEET

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

YES ☒

OR

YES ☐VERSION 12
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

67663 74 34538462

Chloroform

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950.72	762	60.98	1127.76	C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R/C (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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)
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	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)	Exponent of equivalent foundation Peclet number, $\exp(\text{Pe})$ (unitless)	Area of crack, A_{crack} (cm^2)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{building} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)	Stratum C effective diffusion coefficient, $D_{\text{eff},c}$ (cm^2/s)	Capillary zone effective diffusion coefficient, $D_{\text{eff},cz}$ (cm^2/s)	Total overall effective diffusion coefficient, $D_{\text{eff},t}$ (cm^2/s)	Diffusion path length, L_d (cm)
15	1.04E+02	0.10	6.67E-01	4.22E-03	4.80E+02	3.84E+02	4.86E-06	5.05E-04	2.3E-05	NA	6.40E-04	7.36E-04	9.71E-04	1935.72

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
2.09E+02	NA	2.09E+02	7.92E+06	2.09E+02

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/ft)	N (unitless)	M (unitless)	D _a (cm ² /s)	D _w (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RIC (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092									
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016									
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020									
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040									
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044									
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025									
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029									
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046									
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039									
SICL	0.07	0.010	1.23	0.187	0.43	0.069	0.0056									
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011									
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030									

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,995	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-08	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	432.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.88E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	7.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-10	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	680 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 08E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	519 15	749 03	12,000	3 1E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	528 15	813 20	14,000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105879 2,4-Dimethylphenol	2 09E+02	5 84E-02	6 95E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108983 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	7 63E-03	25	393 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	659 79	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	684 20	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 08E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	5 05E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 61E-06	25	715 90	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	2 06E-01	6 60E-04	1 11E-04	25	655 95	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 33E+05	2 26E-02	5 58E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-03	3 88E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319546 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 44E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041138

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Initial groundwater conc., C_w ($\mu\text{g/L}$)

79016 68.41538462

Chemical

Trichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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)
16	15	1950.72	762	60.96	1127.78	C	S	Si

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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

Used to calculate risk-based groundwater concentration

1.0E-06

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.48E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.944
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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)
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{cz} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^{tot} (cm^2/s)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.16E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	4.82E-04	5.55E-04	7.32E-04	1935.72
Convection path length, L_p (cm)				Average vapor flow rate into bldg, Q_{vapor} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)			
	15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	4.07E-06	1.13E-03	1.7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
1.27E+03	NA	1.27E+03	1.10E+06	1.27E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α _s (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)	0.0092	0.016
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.0092	0.016
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.032
L	1.04	0.036	1.56	0.359	0.43	0.078	0.032	0.032	0.064
LS	14.59	0.124	2.28	0.581	0.41	0.057	0.040	0.040	0.080
S	29.70	0.145	2.68	0.627	0.43	0.045	0.045	0.045	0.090
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.025	0.050
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.058
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.0092
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.0078
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.0112
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.022
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.030	0.060

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H _r (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+08	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-08	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	1.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.48E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	4.6E-03	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	10,000	0.0E+00	1.4E-01
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	3.5E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	0.0E+00
67663	Chloroform	3.98E+01	2.50E-03	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	8.00E-02	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	5.89E+01	1.04E-01	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72208	Endrin	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72435	Methoxychlor	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72548	DDD	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72559	DDE	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
74839	Methyl bromide	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.03E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	313.00	510.00	6,708	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	5.34E-04	1.60E-03	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-01	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,331	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 35E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 37E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	7 50E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	9700	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E-06	7 88E-03	2 33E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-08	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 13E-02	4 53E-06	5 10E-01	4 59E-04	1 12E-05	825 22	15,000	0 0E+00	7 0E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+04	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 32E-03	862 20	15,000	0 0E+00	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 20	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	7 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 9E-07	0 0E+00
129000 Pyrene	1 05E+05	7 36E-02	1 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	516 50	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	1078 24	17,000	2 1E-04	0 0E+00
183395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	1 60E-06	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	4 55E-03	1 11E-04	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	1019 70	16,000	2 1E-05	0 0E+00
207088 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	4 55E-03	1 61E-05	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	4 8E-03	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	587 38	7,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	770 00	12,938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	746 87	11,000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	848 76	13,000	2 6E-03	0 0E+00
621647 N-Nitrosod-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	1750 00	14,127	0 0E+00	3 0E-04
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	873 31	14,000	3 2E-04	0 0E+00
7439976 Mercury (elemental)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	539 37	19,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	512 27	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	475 22	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	482 20	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04				
53468219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04				

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER	ENTER	Chemical	
Chemical CAS No	Initial groundwater conc		
(numbers only, no dashes)	C_w ($\mu\text{g/L}$)		
79005	2 526153846	1,1,2-Trichloroethane	
ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER	ENTER
16	15	ENTER	ENTER
		Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)
		762	80 96
		ENTER	ENTER
		Totals must add up to value of L_{wt} (cell D28)	Thickness of soil stratum C, h_C (cm)
			1127 76
		ENTER	ENTER
		Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table
		C	S
		SI	
		ENTER	ENTER
		Soil stratum A SCS soil type (used to estimate soil vapor permeability)	User-defined stratum A soil vapor permeability, k_v (cm^2)

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43
ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	40	961	961	488	0 1	0 45	0 3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_c (yrs)	Averaging time for noncarcinogens, AT_{nc} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target carcinogens, TR (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
					Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm ³ /cm ³)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm ³ /cm ³)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm ³ /cm ³)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.130	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm ² /s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm ² /s)	Total overall effective diffusion coefficient, D_{eff}^{tot} (cm ² /s)	Diffusion path length, L_0 (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	5.10E-04	5.80E-04	7.69E-04	1935.72
Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{total} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, $exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)			
15	2.33E+01	0.10	6.67E-01	3.17E-03	3.84E+02	3.68E+03	4.20E-06	9.80E-05	1.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.55E+03	NA	1.55E+03	4.42E+06	1.55E+03

INCREMENTAL RISK CALCULATIONS:

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

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.033	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.069	0.0058
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (ug/m ³) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.78E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-08	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	586.55	839.36	13,000	2.1E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	10,000	0.0E+00	1.4E+01
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	13,000	4.6E-03	0.0E+00
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.58E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.59E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	5.66E-03	25	363.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.66E-03	25	374.24	545.00	12,000	0.0E+00	1.1E-03
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	14,000	0.0E+00	1.8E-02
72208	Endrin	1.23E-04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	4.00E-06	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	2.10E-05	25	276.71	467.00	5,714	0.0E+00	5.0E-03
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.19E-02	25	259.25	510.00	5,250	8.4E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
74839	Methyl bromide	1.86E+01	1.06E-01	1.23E-06	1.52E+04	1.11E+00	6.24E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75092	Methylene chloride	4.57E+01	1.04E-01	1.00E-05	1.16E+03	1.24E+00	1.80E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75150	Carbon disulfide	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E+00	3.02E-02	25	603.69	848.31	13,000	1.3E-03	0.0E+00
75252	Bromofom	5.50E+01	2.98E-01	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	512.15	746.00	10,931	0.0E+00	7.0E-05
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	386.15	602.00	8,322	1.6E-05	0.0E+00
76448	Heptachlor	1.12E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	419.60	661.15	12,155	0.0E+00	2.1E-01
76474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	550.54	803.15			
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	550.54	803.15			
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	4 51E-07	1 85E-05	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	3 85E-08	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	5 17E-05	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	5 00E-06	2 05E-04	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 39E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	2 61E-03	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	6 26E-07	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	8 15E-03	3 34E-01	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	2 44E-08	1 00E-06	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-08	3 19E-04	749 03	12,000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	2 00E+03	5 90E-02	7 50E-06	3 10E+01	4 83E-04	1 98E-02	748 40	10,373	0 0E+00	1 4E-01
95476 p-Xylene	7 24E+02	1 94E-02	6 74E-06	3 11E+00	4 00E-09	1 64E-07	754 03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	3 63E+02	8 70E-02	1 00E-05	1 78E+02	5 20E-03	2 13E-01	630 30	8,661	7 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	9 12E+01	7 40E-02	8 30E-06	2 60E+04	1 20E-06	4 92E-05	697 60	10,800	0 0E+00	1 8E-01
95578 2-Chlorophenol	6 17E+02	6 90E-02	7 90E-06	1 58E+02	3 90E-04	7 79E-02	705 00	9,700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	3 90E-04	1 60E-02	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	1 78E-04	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	2 40E-05	9 84E-04	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	3 63E+02	7 50E-02	1 69E+02	3 23E-01	7 88E-03	3 23E-01	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	7 76E+02	7 10E-02	8 00E-06	3 10E+02	2 76E-03	1 13E-01	684 75	9,271	0 0E+00	8 0E-01
106423 p-Xylene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	2 00E-06	8 20E-05	616 20	8,525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	7 66E-03	3 14E-01	707 60	11,329	0 0E+00	7 0E-02
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	2 43E-03	9 98E-02	684 75	9,271	0 0E+00	8 0E-01
107062 1,2-Dichloroethane	6 61E+01	4 83E-02	1 01E-05	3 30E+03	3 32E-07	1 36E-05	561 00	11,689	0 0E+00	1 4E-02
108054 Vinyl acetate	1 74E+01	1 04E-01	9 90E-06	8 52E+03	9 78E-04	4 01E-02	754 00	7,643	2 6E-05	0 0E+00
108383 m-Xylene	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	2 10E-02	519 13	7,800	0 0E+00	2 0E-01
108883 Toluene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	7 34E-03	3 01E-01	617 05	8,523	0 0E+00	7 0E+00
108907 Chlorobenzene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	6 63E-03	2 72E-01	632 40	7,930	0 0E+00	4 0E-01
108952 Phenol	2 88E+01	7 30E-02	8 70E-06	4 72E+02	3 71E-03	1 52E-01	581 79	7,930	0 0E+00	4 0E-01
111444 Bis(2-chloroethyl)ether	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 80E-05	1 63E-05	694 20	10,920	0 0E+00	2 1E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 53E-06	5 10E-01	1 02E-07	5 82E-05	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	1 12E-05	5 82E-05	825 00	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	6 88E-05	1 32E-03	882 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	1 32E-03	5 41E-02	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	6 51E-05	2 67E-03	873 00	13,121	0 0E+00	1 1E+00
120832 2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	1 42E-03	6 51E-05	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	3 17E-06	1 30E-04	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	9 27E-08	3 80E-06	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 03E-05	2 60E+03	7 83E-04	1 10E-05	936 00	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	7 54E-01	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 07E-03	1 10E-05	544 00	7,192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 11E-04	1 11E-04	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	9 39E-03	3 85E-01	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	1 60E-06	1 11E-04	905 00	13,815	0 0E+00	1 4E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	8 29E-07	1 70E-04	1019 70	16,000	2 1E-05	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	9 46E-05	7 14 15	979 00	16,455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	1 70E-04	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	1 06E-05	3 05E-05	839 36	13,000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	7 44E-07	1 77E-02	587 38	7,000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	1 77E-02	7 46E-07	770 00	12,938	1 9E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	7 46E-07	2 25E-06	746 87	11,000	2 0E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	9 51E-06	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	6 00E-06	1 14E-02	873 31	14,000	3 2E-04	0 0E+00
621847 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	4 60E-03	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	2 90E-04	2 90E-04	512 27	19,000	1 0E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	6 00E-06	6 00E-06	475 22	18,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 44E-01	2 46E-04	2 46E-04	475 22	18,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-01	4 60E-03	4 60E-03	482 20	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 90E-04	2 90E-04				
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	2 90E-04				
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	5 20E-04				

7041150

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998

YES

X

OR

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

YES

ENTER ENTER
Chemical Initial
CAS No groundwater
(numbers only, conc,
no dashes) C_w
($\mu\text{g/L}$)

Chemical

127184 2 527692308

Tetrachloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
16	15	1950.72	762	60.96	1127.78	C	S	SI	
			Totals must add up to value of L_{WT} (cell D28)						
			Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)		Soil stratum A SCS soil type (used to estimate soil vapor permeability) OR User-defined stratum A soil vapor permeability, k_v (cm^2)	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_1 (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{te} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.130	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm ² /s)	Total overall effective diffusion coefficient, D_{eff}^T (cm ² /s)	Diffusion path length, L_u (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.492	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	6.66E-04	1935.72

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{rad} (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/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	3.82E-06	1.80E-03	5.8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc, noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc, (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc, (ug/L)
2.33E+03	NA	2.33E+03	2.00E+05	2.33E+03

INCREMENTAL RISK CALCULATIONS.

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

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.45	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	805.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	2.14E+04	1.25E-02	4.74E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	4.6E-03	0.0E+00
65850	Benzoic Acid	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	1.4E+01
67641	Acetone	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67663	Chloroform	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	895.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.33E+03	2.28E-01	5.66E-03	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.75E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.61E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78876	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.10E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.90E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85587 Butyl benzyl phthalate	5 75E-04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-00	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-08	879 00	12 866	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	1 98E+00	6 26E-07	7 48E-00	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14 000	3 4E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	8 25E-06	8 00E-02	3 19E-04	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E-02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E-04	4 92E-05	1 20E-06	897 60	9 700	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	705 00	9 572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	638 00	8 737	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	707 60	11 329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	616 20	8 525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	3 32E-07	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	9 78E-04	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	684 20	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	3 98E-07	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	8 20E-02	9 10E-06	5 10E-01	4 59E-04	1 02E-07	674 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 66E-02	3 40E-01	4 18E-06	1 02E-07	6 68E-05	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 51E-05	825 00	14 447	4 8E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	873 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 17E-05	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	8 52E-02	1 42E-03	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	1 47E+02	3 48E-02	7 08E-06	4 50E+03	1 30E-04	3 17E-06	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorobromomethane	9 55E+01	2 03E-01	7 06E-05	2 70E+02	3 80E-06	9 27E-08	879 27	15 000	2 1E-04	0 0E+00
127184 Tetrachloroethylene	6 31E+01	1 98E-02	1 08E-05	2 60E+03	3 21E-02	7 83E-04	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14 370	0 0E+00	1 1E-01
156692 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	1078 24	17 000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	7 192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 58E-05	1 60E-06	839 37	13 000	4 9E-03	0 0E+00
205992 Benzofluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	905 00	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	849 37	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	979 00	13 000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	587 38	7 000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	770 00	12 938	1 9E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 06E-05	849 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 44E-07	839 36	13 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	1 77E-02	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	1024573 Heptachlor epoxide	5 45E-01	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
8001352 Toxaphene	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11097697 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	2 00E+05	1 58E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19 000	1 0E-04	0 0E+00
330E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	5 20E-04	475 22	18 000	1 0E-04	0 0E+00
53468219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

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

VERSION 1.2
September, 1998

YES ☒

OR

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

YES ☐

ENTER	ENTER
Chemical	Initial
CAS No	groundwater
(numbers only, no dashes)	conc.
	C _w
	(µg/L)

79345	46 54846154
-------	-------------

Chemical
1,1,2,2-Tetrachloroethane

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Totals must add up to value of L_{wt} (cell D28)			ENTER	ENTER	ENTER	ENTER
			Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, (Enter value or 0)	Thickness of soil stratum C, (Enter value or 0)				
			h_A (cm)	h_B (cm)	h_C (cm)	ENTER	ENTER	ENTER	ENTER
			Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, (Enter value or 0)	Thickness of soil stratum C, (Enter value or 0)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	User-defined soil vapor permeability, k_v (cm^2)
16	15	1950 72	782	60 96	1127 76	C	S	SI	

[illegible]

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enct} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_B (cm)	Enclosed space floor width, W_B (cm)	Enclosed space height, H_B (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging	Averaging	Exposure	Exposure	Exposure	Target	Target
time for	time for	duration,	frequency,	risk for	hazard	hazard
carcinogens,	noncarcinogens,	ED	EF	carcinogens,	quotient for	quotient for
ATc	ATnc	(yrs)	(days/yr)	(unitless)	THQ	THQ
(yrs)	(yrs)	(yrs)	(yrs)	(unitless)	(unitless)	(unitless)
70	30	30	350	4.0E-02	4	4

1 0E-06	1
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Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^\circ\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Normal boiling point, T_B ($^\circ\text{K}$)	Critical temperature, T_C ($^\circ\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$)	Reference conc., RfC (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

7041153

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_r (cm)														
Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{se} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rg} (cm ²)	Stratum A 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)			
Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)		
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)														
5.63E+04	9.24E+05	4.16E-04	15	10.480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.83E-04	7.78E-04	1935.72		
Convection path length, L_p (cm)	Source vapor conc, C_{source} (ug/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)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, RIC (mg/m ³)					
15	8.36E+00	0.10	6.67E-01	2.90E-03	3.84E+02	4.23E-06	3.54E-05	5.8E-05	NA					

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
1.19E+03	NA	1.19E+03	2.97E+06	1.19E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _w (cm ² /s)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)	
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092		
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016		
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020		
LS	14.59	0.124	2.28	0.581	0.41	0.057	0.040		
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044		
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025		
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029		
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046		
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039		
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056		
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011		
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030		

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc, RHC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	4.63E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.89E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.66E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	7.68E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,966	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 88E-05	4 51E-07	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 35E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-08	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 28E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 30E-06	7 48E+00	6 28E-07	1 53E-08	13,977	0 0E+00	0 0E+00
87883 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	3 23E+03	3 34E-01	8 15E-03	10,206	2 2E-05	0 0E+00
87885 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	6 69E-06	7 87E+03	8 20E-05	2 00E-06	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 86E-02	2 43E-03	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	7,800	0 0E+00	2 0E-01
108383 Toluene	4 07E+02	7 00E-02	8 60E-06	5 26E+02	3 01E-01	7 34E-03	8,523	0 0E+00	7 0E+00
108883 Chlorobenzene	1 82E+02	7 30E-02	8 70E-06	4 72E+02	2 72E-01	6 63E-03	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 19E-02	4 58E-06	5 10E-01	4 59E-04	1 12E-05	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E+02	2 74E-03	6 68E-05	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	10,471	0 0E+00	2 0E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	7 77E-06	4 50E+03	1 30E-04	3 17E-06	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	708 17	0 0E+00	2 0E-02
124481 Chlorobromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	814 00	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	8,000	2 4E-05	0 0E+00
129000 Pyrene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	7,192	0 0E+00	3 5E-02
156805 trans-1,2-Dichloroethylene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	1 23E+06	2 28E-02	5 58E-06	1 50E-03	4 55E-03	1 11E-04	17,000	2 1E-04	0 0E+00
208440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	15,000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+08	2 28E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	13,815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	16,000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	16,455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	13,000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 06E-05	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 44E-07	13,000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	7,000	3 7E-05	2 0E-02
1024573 Heptachlor epoxide	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	12,938	1 9E-04	0 0E+00
7439976 Mercury (elemental)	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	11,000	2 0E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	1 14E-02	14,127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-06	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	18,000	1 0E-04	0 0E+00

7041162

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X ☐

OR

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

YES ☐

ENTER ☐ ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

156592 10.28

Chemical

cis-1,2-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v , cm^2)
16	15	1950.72	762	60.96	1127.76	C	SI

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_s (cm)	Enclosed space floor width, W_s (cm)	Enclosed space height, H_s (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	40	961	961	488	0.1	0.45	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_c (yrs)	Averaging time for noncarcinogens, AT_{nc} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for carcinogens, TR (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Used to calculate risk-based groundwater concentration
70	30	30	350	1.0E-06	1	

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^\circ\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B ($^\circ\text{K}$)	Critical temperature, T_C ($^\circ\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., RIC (mg/m^3)
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

7041164

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.38E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	4.56E-04	5.24E-04	6.91E-04	1935.72
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{vair} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{s}^{-1}$)	Reference conc., RfC (mg/m ³)			
15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	3.92E-06	4.49E-04	NA	3.5E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	8.13E+04	8.13E+04	3.50E+06	8.13E+04	NA	NA

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.0092
CL	0.26	0.019	1.31	0.237	0.088
L	1.04	0.036	1.56	0.359	0.095
LS	14.59	0.124	2.28	0.561	0.078
S	29.70	0.145	2.68	0.627	0.040
SC	0.12	0.027	1.23	0.187	0.045
SCL	1.31	0.059	1.48	0.324	0.100
SI	0.25	0.016	1.37	0.270	0.029
SIC	0.02	0.005	1.09	0.083	0.0046
SICL	0.07	0.010	1.23	0.187	0.0039
SIL	0.45	0.020	1.41	0.291	0.0056
SL	4.42	0.075	1.89	0.471	0.011
					0.030

Chemical Properties Lookup Table											
CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	1.44E-07	25	605.28	827.85	15,000
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.80	7,127
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	586.55	839.36	13,000
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955
67663	Chloroform	3.98E+01	2.50E-03	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988
67721	Hexachloroethane	1.78E+03	8.00E-02	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	895.00	9,510
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346
71556	1,1,1-Trichloroethane	5.89E+01	7.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342
72208	Endrin	1.10E+02	1.25E-02	4.74E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136
72435	Methoxychlor	1.23E+04	1.56E-02	4.46E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000
72548	DDO	9.77E+04	1.69E-02	4.76E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000
72559	DDE	1.00E+06	1.44E-02	5.87E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000
74839	Methyl bromide	4.47E+06	1.06E-01	1.23E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000
75014	Vinyl chloride (chloroethene)	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714
75092	Methylene chloride	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,250
75150	Carbon disulfide	4.57E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	8,405
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391
75274	1,1-Dichloroethane	5.50E+01	2.98E-02	1.06E-05	3.10E+03	2.19E-02	5.34E-04	25	323.35	596.00	7,000
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,895
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	2.25E+03	1.07E+00	2.81E-02	25	304.75	578.05	6,247
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	1.09E-03	25	603.69	846.31	13,000
78591	Isophorone	4.68E+01	6.23E-02	7.76E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590
79016	Tnchloroethylene	1.66E+02	7.90E-02	9.10E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	1.10E+03	4.22E-02	1.03E-02	25	360.36	544.20	7,505
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996
					4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	630 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	519 15	749 03	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E-02	3 19E-04	7 78E-06	25	582 15	813 20	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 81E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	8 00E-06	2 76E-03	25	418 31	636 00	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 09E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	6 69E-06	7 87E+03	8 20E-05	2 00E-06	25	411 52	616 20	8,525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 83E+02	3 14E-01	7 66E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 81E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	535 65	751 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-05	25	412 27	617 05	7,930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 18E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	404 87	591 79	7,800	0 0E+00	2 0E-01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	3 80E-07	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	482 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	416 14	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	394 40	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	687 95	936 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 00E-05	25	333 65	544 00	7,192	0 0E+00	3 5E-02
155532 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 11E-04	25	715 90	905 00	13,815	0 0E+00	1 4E-01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	9 39E-03	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benz(a)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 60E-06	25	655 95	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 11E-04	25	753 15	905 00	13,815	0 0E+00	1 4E-01
207089 Benz(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 48E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	25	603 01	839 37	13,000	4 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 06E-05	25	596 55	839 36	13,000	5 3E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-02	25	558 00	770 00	12,938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	7 46E-07	25	509 60	746 87	11,000	2 0E-03	0 0E+00
602202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	2 25E-06	25	613 96	848 76	13,000	2 8E-03	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	1 14E-02	25	657 15	873 31	14,000	3 2E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	25	402 50	539 37	19,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-02	2 48E-04	4 60E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-01	1 89E-01	2 00E-03	25	119E-02	475 22	18,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	1 56E-02	2 22E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041168

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

Carbon tetrachloride

58235 28 37692308

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950.72	762	60.96	1127.76	C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7.127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{ae} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_e (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)
9.46E+08	1935.72	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7,798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	5.48E-04	7.20E-04	1935.72
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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 number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, C_{building} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$)	Reference conc, RIC (mg/m ³)			
15	8.53E+02	0.10	6.67E-01	3.16E-03	3.84E+02	3.77E+03	4.02E-06	3.43E-03	1.5E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
4.72E+01	NA	4.72E+01	7.93E+05	4.72E+01

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (μ g/m ³) ⁻¹	Reference conc., RIC (mg/m ³)	
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51265	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	3.88E-03	25	458.00	695.05	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E-01	1.06E-01	1.23E-06	1.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	2.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	596.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethane	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	523.00	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Tnchloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87583 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 1E-06	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	4 92E+05	4 92E+05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
99953 Nitrobenzene	6 46E+01	7 80E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	7 0E-02
103679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 38E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	5 30E+03	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	7 30E+01	1 38E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	358 65	561 00	7 643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	404 87	632 40	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	882 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	6 31E+01	1 96E-01	8 20E-06	2 00E+02	7 54E-01	7 83E-04	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 48E-02	6 21E-06	1 60E+03	3 40E-05	9 46E-05	25	714 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	1 32E-02	4 86E-06	1 80E-03	6 97E-03	1 70E-04	25	603 01	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+08	3 47E+01	6 26E-02	2 40E+01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E+01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 06E-05	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 47E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	25	559 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	619 98	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
1109825 Aroclor 1260 (PCB-1260)	11097891 Aroclor 1254 (PCB-1254)	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
		2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041174

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

67863 11 84857 143

Chloroform

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.84	914.4	152.4	1005.84		C	S	C	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{ex} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_d (cm)	ENTER Enclosed space width, W_s (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1047

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (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	2.3E-05	0.0E+00

7041176

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rs} (cm ²)	Stratum A 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)
9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	6.40E-04	7.36E-04	1.07E-03	2057.64

Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vad} (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., $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	1.04E+02	0.10	5.70E-01	4.22E-03	3.84E+02	1.96E+02	4.64E-06	4.83E-04	2.3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
2.19E+02	NA	2.19E+02	7.92E+06	2.19E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.581	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0058
SL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	1.99E-03	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
67641	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67663	Chloroform	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67721	Hexachloroethane	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
71363	Butanol	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71432	Benzene	6.92E+00	8.00E-02	9.80E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	1.33E+03	7.08E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	2.76E+03	1.11E+00	2.71E-02	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	510.00	5,250	8.4E-05	0.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E-02	3.02E-02	25	423.35	596.00	6,391	0.0E+00	3.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	333.15	585.85	7,000	1.1E-06	0.0E+00
75343	1,1-Dichloroethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	360.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1,2-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.75	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	0.0E+00	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+02	2.93E-02	25	512.15	746.00	10,331	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.19E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.60E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	25	813 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	3 34E+01	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	1 95E+03	2 45E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	3 11E+00	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	9 12E+01	7 40E-02	8 30E-06	2 60E+04	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	6 17E+02	6 90E-02	7 90E-06	1 56E+02	1 20E-06	25	453 57	705 00	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	3 88E+02	5 01E-02	9 46E-06	2 20E+04	3 90E-04	25	47 53	675 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	6 46E+01	7 60E-02	8 80E-06	2 09E+03	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	3 63E+02	7 50E-02	7 80E-06	3 23E+01	2 78E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	105679 2,4-Dimethylphenol	7 76E+02	8 00E-06	3 10E+02	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
100425 Styrene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	7 68E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+00
105423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	2 43E-03	25	503 65	754 00	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	9 78E-04	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 71E-03	25	455 02	694 20	10 920	0 0E+00	2 1E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	3 98E-07	25	451 15	659 79	9 000	3 3E-04	0 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	1 72E+04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 02E-07	25	657 15	808 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	6 88E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	6 51E-05	25	582 55	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	2 67E-03	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 98E+04	3 24E-02	7 74E-06	4 34E-02	4 42E-03	25	482 15	708 17	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrofluorene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 10E-05	25	667 95	936 00	14 370	0 0E+00	3 5E-02
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	7 0E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 60E-06	25	320 85	516 50	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	1 11E-04	25	715 90	969 27	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	1 11E-04	25	655 95	905 00	13 815	0 0E+00	1 1E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	8 29E-07	25	714 15	979 00	16 455	2 1E-05	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	9 46E-05	25	603 01	839 37	13 000	4 9E-03	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	2 00E+00	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	2 00E+00	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	1024573 Heptachlor epoxide	8 32E+04	1 32E-02	2 00E-01	5 1E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25					

CHEMICAL PROPERTIES SHEET

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, $\Delta H_{v,p}$ (cal/mol)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc. R/C (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{we} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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 permeter, X_{crack} (cm)
9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	4.82E-04	5.55E-04	8.07E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/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 Pelet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
15	2.78E+02	0.10	5.70E-01	3.20E-03	3.84E+02	1.05E+03	3.93E-06	1.09E-03	1.7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.31E+03	NA	1.31E+03	1.10E+06	1.31E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm·m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	980.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	17,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	524.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	501.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.0E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.0E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,391	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.49E-02	1.03E-05	3.10E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.80E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13 000	0 0E+00	7 0E+01
86308 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13 977	5 7E-06	0 0E+00
87693 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	3 34E-01	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	5 90E-02	7 90E-06	3 10E+01	1 98E-02	4 83E-04	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9 572	0 0E+00	1 8E+01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13 000	0 0E+00	3 5E+01
95953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	5 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11 889	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8 523	0 0E+00	7 0E+00
108893 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	694 20	10 920	0 0E+00	2 1E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	591 79	7 930	0 0E+00	4 0E+01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	832 40	8 410	0 0E+00	2 0E+02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethoxyethyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-08	1 02E-07	867 15	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-05	2 70E-02	3 80E-06	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 1E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	938 00	14 370	0 0E+00	1 1E+01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	544 00	7 192	0 0E+00	3 5E+02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	516 50	6 717	0 0E+00	7 0E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	3 40E-05	8 29E-07	1019 70	16 455	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 28E+03	1 42E-02	7 34E-06	2 40E-01	3 08E-05	7 44E-07	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	587 38	7 000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	657 15	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

79005 3 784285714

1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm^2)
16	15	2072.64	914.4	152.4	1005.84		C	C

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space thickness, L_{rock} (cm)	ENTER Soil-bldg floor pressure differential, ΔP (g/cm^2)	ENTER Enclosed space length, L_b (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based
groundwater concentration

1.0E-06

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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 ² /mol)	Henry's law constant at ave groundwater temperature, H_{ts}^* (unitless)	Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	5.10E-04	5.80E-04	8.44E-04	2057.64
Convection path length, L_p (cm)	Source vapor conc, C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vol} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, RfC (mg/m ³)			
15	2.33E+01	0.10	5.70E-01	3.17E-03	3.84E+02	1.12E+03	4.04E-06	9.43E-05	1.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.61E+03	NA	1.61E+03	4.42E+06	1.61E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _i (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.827	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{RC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	7.93E+02	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+05	7.80E-02	8.80E-06	9.40E-03	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67841	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Buland	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.73E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	966.20	12,000	0.0E+00	1.1E-03
72548	DDD	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72559	DDE	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.84E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
74839	Methyl bromide	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	276.71	487.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.86E+01	1.06E-01	1.23E-06	2.78E+03	1.11E+00	2.71E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	303.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	386.15	620.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
		7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04						

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	680 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	6 10E-06	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 18E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	5 90E+02	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	411 52	616 20	8,525	0 0E+00	0 0E+00
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	697 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
111444 Bis(2-chloroethyl)ether	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
115297 Endosulfan	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	0 0E+00	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117840 Di-n-octyl phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 82E-06	6 51E-05	25	657 15	806 00	15,959	4 0E-06	0 0E+00
118741 Hexachlorobenzene	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
120127 Anthracene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	1 42E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120832 2,4-Dichlorophenol	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	25	482 15	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dinitrotoluene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	1 84E-02	25	394 40	620 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	687 95	936 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	7 0E-02
156592 cis-1,2-Dichloroethylene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	1 67E-01	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
193385 Indeno(1,2,3-cd)pyrene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	6 56E-05	2 25E-06	25	655 95	905 00	13,815	0 0E+00	1 4E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 66E-06	2 20E+05	4 55E-03	8 29E-07	25	753 15	1019 70	16,000	2 1E-06	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 80E-04	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 66E-06	8 00E-04	3 40E-05	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 06E-05	25	586 55	839 36	13,000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	4 35E-04	7 44E-07	25	381 15	587 38	7,000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 77E-02	25	558 00	770 00	12,938	1 9E-04	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 46E-07	25	509 60	746 87	11,000	2 0E-03	0 0E+00
542756 1,3-Dichloropropane	6 92E+01	3 27E-02	7 26E-06	1 82E-02	3 08E-05	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 30E-02	4 32E-06	2 00E+01	3 90E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 82E-02	4 67E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	8 00E-02	1 89E-01	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					

DATA ENTRY SHEET

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

YES

X

OR

YES

VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

127184 33 08642857

Tetrachloroethylene

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	914.4	152.4	1005.84		C	S	C	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8.288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_w (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in 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 penetrometer, X_{crack} (cm)
9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm ² /s)	Capillary zone effective diffusion coefficient, D_{eff}^{cz} (cm ² /s)	Total overall effective diffusion coefficient, D_{eff}^{total} (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+06	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	5.05E-04	7.33E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc., C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vair} (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, $C_{building}$ (ug/m ³)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, R_{fc} (mg/m ³)
15	4.71E+02	0.10	5.70E-01	2.92E-03	3.84E+02	2.06E+03	3.71E-06	1.75E-03	5.8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc, carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc, noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc, ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc, ($\mu\text{g/L}$)
2.40E+03	NA	2.40E+03	2.00E+05	2.40E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.0045
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SH	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (µg/m ³) ¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
55235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,968	2.3E-05	0.0E+00
71363	Butanol	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71432	Benzene	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72208	Endrin	1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72435	Methoxychlor	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72548	DDD	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72559	DDE	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
74839	Methyl bromide	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
75014	Methyl chloride (chloroethane)	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75092	Vinyl chloride	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75150	Carbon disulfide	1.17E+01	1.01E-01	1.17E-05	3.10E+03	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75252	Bromochloromethane	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	8.71E+01	2.98E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75343	1,1-Dichloroethane	5.50E+01	1.49E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75354	1,1,2-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
76448	Heptachlor	5.89E+01	9.00E-02	1.04E-05	2.25E-01	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
77474	Hexachlorocyclopentadiene	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
78591	Isophorone	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78875	1,2-Dichloropropane	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
79005	1,1,2-Trichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79016	Trichloroethylene	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
83329	Acenaphthene	9.33E+01	7.10E-02	7.80E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
		7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	1 12E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 80	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 17E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	488 15	738 00	10 206	2 2E+05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 68E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	7 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 36E+05	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	453 02	694 20	10 920	0 0E+00	2 1E+02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 16E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	485 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	938 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-03	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	655 95	905 00	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 48E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E+02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	7 28E-01	7 28E-01	7 46E-07	25	509 60	748 87	11 000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	9 51E-06	25	613 96	848 76	13 000	2 8E-03	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E+04
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 13E-02	5 20E-04	25					
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					

DATA ENTRY SHEET

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

79345 47 69428571

1,1,2,2-Tetrachloroethane

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)
16	15	2072 84	914 4	152 4	1005 84	C	C

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)
15	0.43	0.2	17	0.42	0.27	17	0.43

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{rock} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Soil stratum C SCS soil type (used to estimate soil vapor permeability)
15	40	961	961	488	0.1	0.45	C

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_c (yrs)	Averaging time for noncarcinogens, AT_{nc} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for carcinogens, TR (unitless)	Target risk for noncarcinogens, THQ (unitless)	Target hazard quotient for THQ	Soil stratum C SCS soil type (used to estimate soil vapor permeability)
70	30	30	350	1.0E-06	1	1	C

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., RfC (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

7041200

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rg} (cm ²)	Stratum A effective vapor permeability, k_v (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, η_{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)
9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm ² /s)	Capillary zone effective diffusion coefficient, D_{eff}^{cz} (cm ² /s)	Total overall effective diffusion coefficient, D_{eff}^{total} (cm ² /s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	10.480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.23E-04	5.83E-04	8.50E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc, C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, $Q_{v,bldg}$ (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, R_{ref} (mg/m ³)
15	8.36E+00	0.10	5.70E-01	2.90E-03	3.84E+02	2.15E+03	4.06E-06	3.39E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.24E+03	NA	1.24E+03	2.97E+06	1.24E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.038	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
68550	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.68E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.16	746.00	10,931	0.0E+00	7.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	12,155	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-08	1 12E+01	1 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 34E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	3 18E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E-01
91941 3,4-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-06	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
106423 p-Xylene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E+00
106476 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
107062 1,2-Dichloroethane	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
108054 Vinyl acetate	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	581 00	7,643	2 5E-05	0 0E+00
108383 m-Xylene	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108883 Toluene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	617 05	8,523	0 0E+00	7 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	7,930	0 0E+00	4 0E-01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	942 94	14,000	2 1E-02	2 1E-02
117817 Bis(2-ethoxyethyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	825 00	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	862 22	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 00E-02	8 23E-06	3 00E+02	5 82E-02	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	2 67E-03	1 42E-03	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11,000	0 0E+00	1 1E-02
121448 1,2-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorobromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E-01
156592 ds-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	1 37E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzof(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 80E-01	3 88E-03	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
309002 Adrin	2 45E+06	1 32E-02	4 86E-06	2 00E+00	4 35E-04	1 70E-04	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-02	3 05E-05	7 44E-07	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	567 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	1 45E-02	8 17E-06	9 89E-03	2 25E-06	2 25E-06	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	5 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	512 27	19,000	1 0E-04	0 0E+00
12874112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18,000	1 0E-04	0 0E+00

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

YES ☐ X ☐

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

156605 23 52222222

trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	914.4	152.4	1005.84	C	S	C	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{encl} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., R/C (mg/m^3)
7.07E-02	1.19E-05	9.39E-03	25	6.717	320.85	516.50	5.28E+01	6.30E+03	0.0E+00	7.0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
9.48E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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 temperature, H^{TS} (unitless)	Vapor viscosity at temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.073	6.48E-03	2.73E-01	1.77E-04	2.87E-03	7.26E-04	4.33E-04	4.98E-04	7.24E-04	2057.64
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(P_e)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)			
15	2.73E+02	0.10	5.70E-01	2.87E-03	3.84E+02	2.38E+03	3.67E-06	1.00E-03	NA	7.0E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
NA	7 28E+04	7 28E+04	6 30E+06	7 28E+04

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.38	0.088
CL	0.26	0.019	1.31	0.237	0.41	0.095
L	1.04	0.036	1.56	0.359	0.43	0.078
LS	14.59	0.124	2.28	0.561	0.41	0.057
S	29.70	0.145	2.68	0.627	0.43	0.045
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.111
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, UR ¹ (μg/m ³) ⁻¹	Reference conc., R _{TC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55533	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-06	25	613.32	842.25	13,000	4.6E-03	0.0E+00
68550	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,348	0.0E+00	3.6E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethane)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	595.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84652 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+00	1 98E-07	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+02	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25	503 65	754 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	25	412 27	651 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	9 27E-08	25	394 40	620 20	8 288	5 8E-07	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	7 83E-04	25	674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 80E-06	3 21E-02	1 12E-05	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 40E-01	4 18E-06	1 02E-07	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	815 18	873 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 32E-05	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	720 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E-02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 66E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 66E-06	8 00E-04	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 48E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 06E-05	25	596 55	839 36	13 000	5 3E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E+02
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7 000	3 7E-05	2 0E+02
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 03E-05	1 77E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	509 60	746 87	11 000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	613 96	848 76	13 000	2 8E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 34E-06	2 00E-01	3 90E-04	9 51E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					

7041210

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

156592 14 005

cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	914.4	152.4	1005.84	C	S	C	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
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

INTERMEDIATE CALCULATIONS SHEET

7041212

Exposure duration, τ (sec)	9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844

Bldg. ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, $D^{\text{eff}}_{\text{cap}}$ (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)

Convection path length, L_p (cm)	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	4.58E-04	5.24E-04	7.61E-04	2057.64

Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	1.15E+02	0.10	5.70E-01	2.98E-03	3.84E+02	1.74E+03	3.79E-06	4.35E-04	NA	3.5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
NA	8.40E+04	8.40E+04	3.50E+06	8.40E+04

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0032
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	25	743.24	990.41	16,000	2.1E-03	0.0E+00
58235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	25	349.90	556.60	7,127	1.9E-05	0.0E+00
58553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	25	624.24	886.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	25	334.32	536.40	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	25	329.20	508.10	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E-03	2.28E-01	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	25	276.71	487.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethane)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	25	363.15	585.85	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	25	330.55	523.00	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	25	488.95	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-08	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-08	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E-00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	25	447 53	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E-00
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	717 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E-00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 843	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	5 12E-04	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-02	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-08	0 0E+00
117840 Di-n-octyl phthalate	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	2 95E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	482 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	0 0E+00
156605 trans-1,2-Dichloroethylene	3 55E+01	7 07E-02	1 13E-05	3 50E+03	1 87E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	3 47E+06	2 26E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 23E+06	2 26E-02	5 66E-06	2 20E+05	6 56E-05	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	714 15	979 00	16 455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 37	13 000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	1 77E-02	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	3 06E+05	7 46E-07	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	4 32E-02	4 23E-06	9 23E+05	2 25E-06	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
7439576 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	4 67E-01	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	2 46E-04	4 60E-06	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	1 89E-01	4 60E-06	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041216

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

75354 22 18785714

1,1-Dichloroethylene

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.84	914.4	152.4	1005.84		C	S	C

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_a (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., RfC (mg/m^3)
9.00E-02	1.04E-05	2.61E-02	25	6.247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.48E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{la} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.18E-04	15	8.353	1.87E-02	7.88E-01	1.77E-04	3.65E-03	9.22E-04	5.47E-04	6.30E-04	9.15E-04	2057.64
		Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{rad} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)			
15	7.88E+02	0.10	5.70E-01	3.84E+02	3.65E-03	3.84E+02	4.48E+02	4.24E-06	3.34E-03	5.0E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater 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)
1.46E+01	NA	1.46E+01	2.25E+06	1.46E+01

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0032
CL	0.25	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SIL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,s} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc. RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenzo(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	7.93E-02	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	895.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.28E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67841	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,985	0.0E+00	3.5E-01
67863	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	8.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72435	Methoxychlor	1.23E+04	1.28E-02	4.74E-06	2.50E-01	3.08E-04	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.10E+02	7.80E-02	8.80E-06	1.35E+03	7.05E-01	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72548	DDD	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72559	DDE	1.00E+06	1.68E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	487.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.78E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	7.66E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	366.15	620.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 00E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 81E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	3 34E-01	2 45E-08	738 20	10,206	2 2E+05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-08	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+01	1 64E-07	4 83E-04	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	591 79	7,930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 72E-04	1 80E-05	942 94	14,000	0 0E+00	2 1E-02
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 86E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	825 00	14,447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	873 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 32E-03	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	708 17	11,000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E-02	3 80E-06	9 27E-08	620 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 80E+03	3 21E-02	7 83E-04	544 00	7,192	0 0E+00	3 5E-02
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	1078 24	17,000	2 1E-04	0 0E+00
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 84E-02	969 27	15,000	2 1E-04	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	8 29E-07	905 00	13,815	0 0E+00	1 4E-01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	9 46E-05	1019 70	16,000	2 1E-05	0 0E+00
183395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	7 14 15	979 00	16,455	2 1E-06	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	6 03 01	839 37	13,000	4 9E-03	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	1 50E-03	4 55E-03	1 06E-05	839 36	13,000	1 8E-03	0 0E+00
207069 Benzo(k)fluoranthene	3 98E+05	2 48E-02	5 26E-06	2 06E-01	6 60E-04	7 44E-07	583 38	13,000	5 3E-04	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 77E-02	770 00	12,938	3 7E-05	2 0E-02
309002 Aldrin	1 26E+03	1 42E-02	7 34E-06	2 40E+01	3 05E-05	7 46E-07	509 60	11,000	2 0E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 40E+01	3 05E-05	7 46E-07	848 76	13,000	2 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 28E-02	1 00E-05	2 80E+03	7 28E-01	9 51E-06	1750 00	14,127	0 0E+00	3 0E-04
542756 1,3-Dichloropropane	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	1 14E-02	873 31	14,000	3 2E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	6 00E-06	539 37	19,000	1 0E-04	0 0E+00
621647 N-Nitrosodipropylamine	1024573 Heptachlor epoxide	8 32E+04	1 32E-02	6 30E-06	5 62E-02	4 67E-01	475 22	18,000	1 0E-04	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	4 23E-06	7 40E-01	4 67E-01	1 14E-02	482 20	18,000	1 0E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06				
11096825 Aroclor 1260 (PCB-1260)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03				
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04				
12674112 Aroclor 1016 (PCB-1016)										
53469219 Aroclor 1242 (PCB-1242)										

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☐ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

107062 5 684285714

1,2-Dichloroethane

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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)
16	15	2072.64	914.4	152.4	1005.84	C	S	C

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	0.42	0.27	1.7	0.43	0.3	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_f (cm)	Enclosed space floor width, W_f (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

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

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,2}$ (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
1.04E-01	9.90E-06	9.78E-04	25	7,843	356.65	561.00	1.74E+01	8.52E+03	2.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2057.64	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)														
Stratum A soil intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{ra} (cm ²)														
Stratum A 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)														
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)														
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)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)														
Stratum C effective diffusion coefficient, D_{eff}^C (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)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} (ug/m ³)														
Average vapor flow rate into bldg, Q_{soil} (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{building}$ (ug/m ³)														
Unit risk factor, URF (ug/m ³) ⁻¹														
Reference conc., RfC (mg/m ³)														
15	2.64E+01	0.10	5.70E-01	4.22E-03	3.84E+02	1.95E+02	4.73E-06	1.25E-04	2.8E-05	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
7.49E+02	NA	7.49E+02	8.52E+06	7.49E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.47E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
69850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	509.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	10,346	0.0E+00	3.5E-01
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.00E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72433	Methoxychlor	9.77E+04	1.58E-02	4.48E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.68E-02	4.78E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72569	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	487.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.08E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.12E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.33E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+03	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84562 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13 977	0 0E+00	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-03	813 20	14 000	3 1E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	7 90E-06	1 56E+02	4 92E-05	1 20E-06	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	8 48E-06	2 05E+04	7 79E-02	2 40E-05	759 13	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	3 90E-04	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	2 00E-06	707 60	8 737	0 0E+00	1 0E+00
100425 Styrene	7 78E+02	7 10E-02	8 69E-06	3 10E+02	1 13E-01	7 66E-03	616 20	8 525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	5 84E-02	8 44E-06	1 89E+02	3 14E-01	7 66E-03	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 81E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	519 13	7 800	0 0E+00	2 0E-01
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	617 05	7 930	0 0E+00	4 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	9 78E-04	561 00	7 643	2 6E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	519 13	7 800	0 0E+00	2 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	6 63E-03	617 05	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	806 00	15 989	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	814 00	11 000	0 0E+00	2 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	4 34E-02	6 51E-05	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	708 17	11 000	0 0E+00	1 0E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzol(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	8 29E-07	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 48E-02	5 66E-06	1 50E+03	3 88E-03	9 48E-05	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	6 21E-06	1 60E-01	6 97E-03	1 70E-04	839 37	13 000	4 9E-03	0 0E+00
308002 Aldrin	1 23E+03	1 42E-02	4 86E-06	2 00E+00	4 35E-04	1 08E-05	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	4 86E-06	2 40E-01	3 05E-05	7 44E-07	587 38	7 000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	770 00	12 938	1 9E-04	0 0E+00
542756 1,3-Dichloropropane	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	770 00	12 938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-04	9 51E-06	2 25E-06	848 76	13 000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E+00
7439976 Mercury (elemental)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
1109685 Aroclor 1260 (PCB-1260)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 50	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	53469219 Aroclor 1242 (PCB-1242)	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3)^{-1}$)	Reference conc., RfC (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rp} (cm ²)	Stratum A 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 penetrometer, X_{crack} (cm)
9.48E+08	2210.04	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	6.40E-04	7.36E-04	9.74E-04	2210.04

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{vair} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation number, $\exp(Pd)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	1.04E+02	0.10	6.67E-01	4.22E-03	3.84E+02	4.80E+02	4.49E-06	4.67E-04	2.3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
2.26E+02	NA	2.26E+02	7.92E+06	2.26E+02

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _t (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.085	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H* (unitless)	Henry's law constant at reference temperature, H (atm·m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.96E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	1.99E-03	4.85E-05	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	880.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-05	2.76E+03	1.11E+00	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+01
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	422.35	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.49E-02	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75252	Bromoform	8.71E+01	2.98E-02	1.03E-05	3.10E+03	6.56E-02	5.34E-04	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	2.61E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	488.95	715.00	10,271	2.7E-07	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	369.62	572.00	7,590	0.0E+00	4.0E-03
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-03	25	386.15	602.00	8,322	1.6E-05	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25					
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03		25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E+01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	5 61E-02	6 10E-06	3 23E+00	3 34E-01	8 15E-03	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 60E-02	6 10E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 4E-05	0 0E+00
87665 Pentachlorophenol	5 92E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	25	582 15	813 20	14 000	3 2E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	5 90E-02	7 50E-06	3 11E+01	1 64E-07	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	25	491 14	754 03	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95487 2-Methylphenol (o-cresol)	9 12E+01	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95501 1,2-Dichlorobenzene	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 80E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95578 2-Chlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E+01
95954 2,4,5-Trichlorophenol	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
98953 Nitrobenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	8 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 65E+02	3 14E-01	7 68E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+02
106467 1,4-Dichlorobenzene	6 17E-02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11 689	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	567 15	806 00	7 643	2 6E-05	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E-04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E+02
115107 3,5-Dichlorophthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	544 00	7 192	0 0E+00	1 1E+01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E+02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
156605 trans-1,2-Dichloroethylene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	1 23E+08	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+08	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 46E-05	25	714 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	603 01	839 37	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 08E-05	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	4 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	25	613 98	848 76	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E+04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	657 15	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

75274 3 743205128

Bromodichloromethane

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48	C	S	SI	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{rack} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space length, L_g (cm)	Enclosed space width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., RfC (mg/m^3)
2.98E-02	1.06E-05	1.60E-03	25	7,000	363.15	585.85	5.50E+01	6.74E+03	1.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{at} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A relative air permeability, k_{ra} (cm^2)	Stratum A 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 permeator, X_{crack} (cm)
Bldg ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.723	1.07E-03	4.49E-02	1.77E-04	1.21E-03	3.22E-04	2.04E-04	2.30E-04	3.27E-04	1509
		Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, $Q_{v,bldg}$ (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, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)			
15	4.49E+01	0.10	6.67E-01	3.84E+02	1.21E-03	3.84E+02	2.07E+09	2.73E-06	1.23E-04	1.8E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.10E+03	NA	1.10E+03	6.74E+06	1.10E+03

INCREMENTAL RISK CALCULATIONS:

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _s (cm ² /s)	D _w (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{vs} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., R _{IC} (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092									
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016									
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020									
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040									
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044									
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025									
SCS	1.31	0.059	1.48	0.324	0.39	0.100	0.029									
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046									
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039									
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056									
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011									
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030									

CAS No.	Chemical	Organic carbon partition coefficient, K _{oc} (cm ² /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{vs} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	805.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55653	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E-03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75232	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84663 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	2 61E+03	2 61E-03	6 37E-05	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10,206	2 2E-05	0 0E+00
87855 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8,661	0 0E+00	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E-02
95964 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	616 20	8,525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	8 17E+02	6 90E-02	7 90E-06	7 38E-01	9 96E-02	2 43E-03	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	632 40	8,410	0 0E+00	2 0E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 63E-05	3 98E-07	694 20	10,920	0 0E+00	2 1E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 80E-05	659 79	9,000	3 3E-04	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 00E-01	4 18E-06	1 02E-07	802 22	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 55E-06	2 00E+00	5 41E-02	1 32E-03	942 94	14,000	0 0E+00	2 1E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	868 22	15,000	0 0E+00	7 0E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E+02	2 67E-03	1 32E-03	825 00	14,447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	873 00	13,121	0 0E+00	1 1E+00
12142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	4 50E+03	1 30E-04	3 17E-06	725 00	10,471	0 0E+00	2 0E-01
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	7,192	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	9 39E-03	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	1 11E-04	915 00	13,815	0 0E+00	1 4E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	9 46E-05	714 15	16,455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	8 29E-07	979 00	16,000	2 1E-05	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13,000	1 8E-03	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13,000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13,000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	770 00	12,938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	6 02E+01	3 27E-02	7 28E-06	1 82E+02	3 08E-05	7 46E-07	746 87	11,000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	848 76	13,000	2 6E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	1024573	8 32E+04	1 32E-02	2 00E-01	3 90E-04	9 51E-06	1750 00	14,127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	873 31	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	539 37	19,000	1 0E-04	0 0E+00
11096925 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	512 27	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 58E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	482 20	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04				

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

Carbon tetrachloride

56235 3 141282051

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D26) Thickness of soil stratum A, (Enter value or 0) h_a (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_b (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C) C	ENTER SCS soil type directly above water table S	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) SI	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48				

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enct} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7.127	349.90	556.80	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	0.230	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	0.150	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	0.130	Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)	0.419	Stratum A soil intrinsic permeability, k_i (cm^2)	9.36E-10	0.746	Stratum A soil relative air permeability, k_{ra} (cm^2)	0.98E-10	17.05	Thickness of capillary zone, L_{ca} (cm)	0.43	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	0.138	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	0.294	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	0.294	Floor-wall seam perimeter, X_{crack} (cm)	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)			Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{ca}^{eff} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)							Diffusion path length, L_d (cm)		
5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	4.74E-04	5.46E-04	7.73E-04	1509													
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D_{crack}^{eff} (cm^2/s)	Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$)	Reference conc., RfC (mg/m ³)																	
15	8.53E+02	0.10	6.67E-01	3.16E-03	3.77E+03	4.91E-06	4.19E-03	1.5E-05	NA																	

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
3.87E+01	NA	3.87E+01	7.93E+05	3.87E+01

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.038	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.581	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SiCL	0.07	0.010	1.23	0.187	0.43	0.089	0.0066
SIL	0.45	0.020	1.41	0.281	0.45	0.087	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm·m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	605.28	827.85	16,000	0.0E+00	7.0E-03
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	349.90	556.60	7,127	1.5E-05	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.87E-06	3.50E+03	6.31E-05	1.54E-06	25	613.32	842.25	13,000	4.8E-03	0.0E+00
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.84E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	696.00	6,391	7.0E-01	7.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.00E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.89E-06	1.80E-01	4.47E-02	1.09E-03	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 26E-06	25	660 60	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	6 33E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	9 92E+02	5 60E-02	6 10E-06	1 95E+03	3 19E-04	2 44E-08	25	582 15	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+00	1 64E-07	4 83E-04	25	491 14	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	10 800	0 0E+00	7 0E-01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	8 501	0 0E+00	1 0E-01
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25	418 31	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 68E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	8 525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	7 540	0 0E+00	1 4E-02
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	0 0E+00	7 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	8 410	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 58E-04	1 12E-05	25	674 43	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	25	486 15	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E-06	3 80E-06	9 27E-08	25	590 00	814 00	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	418 14	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 60E-06	25	809 15	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	25	320 85	516 50	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 23E+05	2 26E-02	5 56E-06	2 00E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	733 15	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06
218019 Chrysene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	1 11E-04	25	655 95	905 00	13 815	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	8 29E-07	25	733 15	16 000	2 1E-05	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	603 01	839 37	13 000	4 9E-03
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E-03	7 28E-01	1 77E-02	25	381 15	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 88E+03	9 23E-06	7 46E-07	25	509 60	748 87	11 000	2 0E-03
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	2 32E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04
53489219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

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

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

Trichloroethylene

79016 144 508

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
18	15	2072.84	701.04	304.8	1066.8	C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_s (cm)	ENTER Enclosed space floor width, W_a (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	981	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration	
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CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., RIC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.48E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.234	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{le} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative permeability, k_{rg} (cm^2)														
Stratum A 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)														
Bldg ventilation rate, $Q_{building}$ (cm^3/s)														
Area of enclosed space below grade, A_g (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)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)														
Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)														
Total effective diffusion coefficient, D_{eff}^T (cm^2/s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg, Q_{soil} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack}^* (cm^2/s)														
Exponent of equivalent foundation number, exp(Pe)														
Area of crack, A_{crack} (cm^2)														
Indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹														
Reference conc., RfC (mg/m ³)														
15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	3.92E-06	1.09E-03	1.7E-06	NA				

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)
1.31E+03	NA	1.31E+03	1.10E+06	1.31E+03	NA	NA

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

VLOOKUP TABLES

Sol Properties Lookup Table						
SCS Sol Type	K_a (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_a (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0058
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ² /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	748.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	7.73E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.38	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,986	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E+01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 14E-08	738 00	14 000	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	12 000	3 1E-08	0 0E+00
88062 2,4,6-Trichlorophenol	3 18E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	10 373	0 0E+00	1 4E-01
91203 Naphthalene	5 90E+02	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	754 03	13 000	1 3E-04	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	748 40	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 90E-06	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 20E-03	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	6 37E-05	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	817 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-05	707 60	11 329	0 0E+00	7 0E-02
105879 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	616 20	8 525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-07	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 35E-05	3 32E-07	561 00	7 843	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	694 20	10 320	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	659 79	9 900	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	873 00	13 121	0 0E+00	1 1E+00
120127 Tetrachloroethene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	708 17	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	814 00	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	620 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	936 00	13 815	0 0E+00	1 4E-01
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	1019 70	16 000	2 1E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	544 00	7 192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	516 50	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	1078 24	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 58E-05	1 60E-06	969 27	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	905 00	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	979 00	16 455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	746 87	11 000	2 0E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	7 44E-07	770 00	12 938	1 9E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 37	13 000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	8 17E-06	8 17E-06	9 89E+03	3 06E-05	7 46E-07	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	1750 00	14 127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	873 31	14 000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	539 37	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	512 27	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	475 22	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	482 20	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04				

7041252

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

1,1,2-Trichloroethane

79005 5 054

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade to bottom of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Totals must add up to value of L_{wt} (cell D28) Thickness of soil stratum A, h_a (cm)		Thickness of soil stratum B, h_b (cm)		Thickness of soil stratum C, h_c (cm)	
16	15	2072.64	701.04	304.8	1066.8						
						ENTER		ENTER		ENTER	
						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)	
						C		S		SI	
										User-defined stratum A soil vapor permeability, k_y (cm^2)	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		Stratum A soil dry porosity, n^A (unitless)		Stratum B soil dry bulk density, ρ_b^B (g/cm^3)		Stratum B soil dry porosity, n^B (unitless)		Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		Stratum C soil dry porosity, n^C (unitless)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3			
						ENTER		ENTER		ENTER	
						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)	
						C		S		SI	
										User-defined stratum A soil vapor permeability, k_y (cm^2)	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{enc} (cm)		Enclosed space floor length, L_s (cm)		Enclosed space floor width, W_s (cm)		Enclosed space height, H_s (cm)		Floor-wall seam crack width, w (cm)		Indoor air exchange rate, ER (1/h)	
15	40	961	961	961	488	0.1	0.45				
						ENTER		ENTER		ENTER	
						Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)		Enclosed space height, H_s (cm)		Indoor air exchange rate, ER (1/h)	
						C		S		SI	
										User-defined stratum A soil vapor permeability, k_y (cm^2)	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Averaging time for carcinogens, AT_c (yrs)		Averaging time for noncarcinogens, AT_{nc} (yrs)		Exposure duration, ED (yrs)		Exposure frequency, EF (days/yr)		Target risk for carcinogens, TR (unitless)		Target hazard quotient for noncarcinogens, THQ (unitless)	
70	30	30	350	1.0E-06	1						
						ENTER		ENTER		ENTER	
						Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)		Enclosed space height, H_s (cm)		Indoor air exchange rate, ER (1/h)	
						C		S		SI	
										User-defined stratum A soil vapor permeability, k_y (cm^2)	

Used to calculate risk-based
groundwater concentration

1.07

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{eA} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	5.10E-04	5.80E-04	7.69E-04	2057.64
Convection path length, L_p (cm)		Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{total} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Pelet number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)			
	15	2.33E+01	0.10	6.67E-01	3.17E-03	3.84E+02	3.68E+03	4.04E-06	9.42E-05	1.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.61E+03	NA	1.61E+03	4.42E+06	1.61E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _w (cm ² /s)	D _a (cm ² /s)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H ¹ (unitless)	Henry's law constant at reference temperature, H ² (atm-m ³ /mol)	Henry's law constant at reference temperature, H ³ (atm-m ³ /mol)	Mean Grain Diameter (cm)	ϕ_s (cm ³ /cm ³)	ϕ_s (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.0092	0.068	0.38	0.068	0.068	0.0092	0.068	0.068
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.41	0.095	0.095	0.095	0.016	0.095	0.095
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.020	0.43	0.078	0.078	0.078	0.020	0.078	0.078
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.040	0.41	0.057	0.057	0.057	0.040	0.057	0.057
S	29.70	0.145	2.66	0.627	0.43	0.045	0.044	0.044	0.43	0.045	0.045	0.045	0.044	0.045	0.045
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.025	0.38	0.100	0.100	0.100	0.025	0.100	0.100
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.39	0.100	0.100	0.100	0.029	0.100	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.46	0.034	0.034	0.034	0.0046	0.034	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.26	0.070	0.070	0.070	0.0039	0.070	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.43	0.089	0.089	0.089	0.0056	0.089	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.45	0.067	0.067	0.067	0.011	0.067	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.030	0.41	0.065	0.065	0.065	0.030	0.065	0.065

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H ¹ (unitless)	Henry's law constant at reference temperature, H ² (atm-m ³ /mol)	Henry's law constant at reference temperature, H ³ (atm-m ³ /mol)	Henry's law constant at reference temperature, H ⁴ (atm-m ³ /mol)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	8.10E-06	8.10E-06	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	1.13E-06	1.13E-06	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.80E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	4.44E-07	4.44E-07	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	1.47E-08	1.47E-08	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	3.05E-02	3.05E-02	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	3.34E-06	3.34E-06	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	4.85E-05	4.85E-05	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	1.40E-05	1.40E-05	598.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.54E-06	1.54E-06	1.54E-06	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	1.54E-06	1.54E-06	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	3.88E-05	3.88E-05	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	3.88E-03	3.88E-03	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	8.80E-06	8.80E-06	458.00	595.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	8.80E-06	8.80E-06	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.00E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	5.58E-03	5.58E-03	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	1.72E-02	1.72E-02	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	7.51E-06	7.51E-06	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Melchiorchlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	1.58E-05	1.58E-05	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	4.00E-06	4.00E-06	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	2.10E-05	2.10E-05	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	6.24E-03	6.24E-03	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	2.71E-02	2.71E-02	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-02	2.19E-02	2.19E-02	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	3.02E-02	3.02E-02	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E-03	2.19E-02	5.34E-04	5.34E-04	5.34E-04	422.35	595.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	1.60E-03	1.60E-03	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	5.61E-03	5.61E-03	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	2.61E-02	2.61E-02	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	1.09E-03	1.09E-03	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	2.71E-02	2.71E-02	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E-04	2.72E-04	6.63E-06	6.63E-06	6.63E-06	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	2.80E-03	2.80E-03	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	9.12E-04	9.12E-04	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	1.03E-02	1.03E-02	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	3.44E-04	3.44E-04	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	1.55E-04	1.55E-04	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	3 23E+00	3 34E-01	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 10E-06	1 95E+03	1 00E-06	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	5 90E-02	7 50E-06	3 10E+01	1 98E-02	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	7 40E-02	8 30E-06	2 60E+04	4 92E-05	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	457 53	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	7 90E-02	7 03E-06	2 09E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 69E+02	3 23E-01	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 17E+01	6 90E-02	7 90E-06	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,889	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	8 20E-01	8 20E-02	9 10E-06	8 28E-04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-05	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 00E-01	4 18E-06	1 02E-07	25	657 15	806 22	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 58E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 56E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 58E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E+03	4 58E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E+03	4 58E-03	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	586 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	586 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	3 06E-05	7 26E-01	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621547 N-Nitrosodip-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 34E-06	8 00E-02	1 89E-01	4 60E-06	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12874112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041258

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

Tetrachloroethylene

127184

56584

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	701.04	304.8	1066.8		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration.

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-}^{-1}$)	Reference conc., R/C (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	4.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum A soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rg} (cm ²)	Stratum A 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)
9.46E+08	2057.64	0.230	0.150	0.130	0.419	9.38E-10	0.746	6.98E-10	17.05	0.43	0.136	0.204	3.844

Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.18E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	4.38E-04	5.05E-04	6.68E-04	2057.64

Convection path length, L_p (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, $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc, RIC (mg/m ³)
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	3.67E-06	1.73E-03	5.8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
2.43E+03	NA	2.43E+03	2.00E+05	2.43E+03

INCREMENTAL RISK CALCULATIONS.

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

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α _s (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.018	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H^1 (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E-06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.64	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13 977	0 0E+00	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	738 00	10 206	2 2E-05	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	8 15E-03	813 20	14 000	3 4E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	707 60	11 329	0 0E+00	7 0E-02
105678 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 68E-03	616 20	8 525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 00E-06	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	617 05	8 523	0 0E+00	7 0E-02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	632 40	8 410	0 0E+00	2 1E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	694 20	10 920	0 0E+00	0 0E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 00E+00	942 94	14 000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	825 00	14 447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 24E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	825 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 42E-03	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E-02	5 82E-02	1 42E-03	873 00	13 467	1 9E-04	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E-03	1 30E-04	3 17E-06	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124881 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	620 20	8 000	2 4E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E-02	7 54E-01	1 84E-02	544 00	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	516 50	6 717	0 0E+00	7 0E-02
193395 Isotend(1,2,3-collipylene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzobifluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 00E-04	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	1019 70	16 455	2 1E-06	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	839 37	13 000	4 8E-03	0 0E+00
309002 Aldrin	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 28E-02	1 00E-05	2 80E+03	3 08E-05	7 44E-07	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	2 40E+01	3 27E-02	7 28E-06	1 82E+02	3 08E-05	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	8 32E+04	5 45E-02	8 17E-06	9 88E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxida	5 20E+01	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	2 57E+05	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 90E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-06	539 37	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

7041264

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

1,1,2,2-Tetrachloroethane

79345 120 6884

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Average groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Thickness of soil stratum A, h_A (cm)		Thickness of soil stratum B, h_B (cm)		Thickness of soil stratum C, h_C (cm)	
16	15	2072.64	701.04	304.8	1066.8						
						ENTER		ENTER		ENTER	
						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)	
						C		S		SI	
						ENTER		ENTER		ENTER	
						User-defined stratum A soil vapor permeability, k_v (cm^2)					

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_b^A (g/cm^3)		Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)		Stratum B soil dry bulk density, ρ_b^B (g/cm^3)		Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)		Stratum C soil dry bulk density, ρ_b^C (g/cm^3)		Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3			
						ENTER		ENTER		ENTER	
						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)	
						C		S		SI	
						ENTER		ENTER		ENTER	
						User-defined stratum A soil vapor permeability, k_v (cm^2)					

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{rock} (cm)		Soil-bldg pressure differential, ΔP (g/cm^2)		Enclosed space floor length, L_g (cm)		Enclosed space floor width, W_g (cm)		Enclosed space height, H_g (cm)		Floor-wall crack width, w (cm)	
15	40	961	961	488	0.1	0.45					
						ENTER		ENTER		ENTER	
						Indoor air exchange rate, ER (1/h)					

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Averaging time for carcinogens, ATc (yrs)		Averaging time for noncarcinogens, ATnc (yrs)		Exposure duration, ED (yrs)		Exposure frequency, EF (days/yr)		Target risk for carcinogens, TR (unitless)		Target hazard quotient for noncarcinogens, THQ (unitless)	
70	30	30	350	1.0E-06	1						
						ENTER		ENTER		ENTER	
						Used to calculate risk-based groundwater concentration					

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{le} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rp} (cm ²)	Stratum A 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_{seam} (cm)
9.46E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm ² /s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm ² /s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	10,480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	5.23E-04	5.83E-04	7.75E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Exponent of equivalent foundation Peclet number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
15	8.36E+00	0.10	6.67E-01	2.90E-03	7.88E+03	4.06E-06	3.39E-05	5.8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.24E+03	NA	1.24E+03	2.97E+06	1.24E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS:

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H ² (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11 000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15 000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E-03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16 000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E-02	1 25E+00	3 05E-02	25	349 90	558 60	7 127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13 000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	598 55	839 36	13 000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	10 000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10 000	0 0E+00	1 4E-01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6 955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6 988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	685 00	9 510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10 346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7 342	8 3E-06	0 0E+00
71558	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7 136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	966 20	12 000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14 000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-08	25	639 90	863 77	14 000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13 000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5 714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5 250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6 708	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6 391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9 479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7 000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 03E-05	5 08E+03	2 30E-01	5 61E-03	25	330 55	523 00	6 895	0 0E+00	5 0E-01
75354	1,1,2-Dichloroethane	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6 247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	848 31	13 000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10 931	0 0E+00	7 0E-05
78591	Isophorone	4 88E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10 271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 82	572 00	7 590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8 322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 38	544 20	7 505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8 996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12 155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 90E-06	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	7 90E-06	1 56E+02	7 79E-02	1 00E-03	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	2 20E+04	1 60E-02	3 90E-04	25	437 53	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	1 60E+02	1 60E-02	1 90E-03	25	457 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	2 20E+04	1 60E-02	3 90E-04	25	437 53	705 00	9 700	0 0E+00	2 0E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	1 78E-04	2 40E-05	25	526 15	759 13	13 000	0 0E+00	3 5E-01
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 13	636 00	8 737	0 0E+00	1 0E+00
103679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 51E-02	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	15 000	0 0E+00	7 0E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	14 447	4 8E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
121142 2,4-Dinitrochlorobenzene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
124481 Chlorodibromomethane	6 31E+01	1 96E-02	7 06E-06	2 70E+02	3 80E-08	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	25	320 85	516 50	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	1 11E-04	25	715 90	989 27	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 55E-03	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 40E-05	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+08	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 40E-01	3 05E-05	7 44E-07	25	381 15	587 38	13 000	5 3E-04	0 0E+00
608202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	4 23E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097891 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041270

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

156605 4 340714286

trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{WT} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	701.04	304.8	1066.8		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{encl} (cm)	ENTER Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{b,0}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., RtC (mg/m^3)
7.07E-02	1.19E-05	9.39E-03	25	6.717	320.85	516.50	5.25E+01	6.30E+03	0.0E+00	7.0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_e (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
9.46E+08	2057 64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.073	6.48E-03	2.73E-01	1.77E-04	2.87E-03	7.26E-04	4.33E-04	4.98E-04	6.80E-04	2057 64
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{sol} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-s}^{-1}$)	Reference conc., RfC (mg/m^3)			
15	2.73E+02	0.10	6.67E-01	2.87E-03	3.84E+02	8.80E+03	3.64E-06	9.93E-04	NA	7.0E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
NA	7.35E+04	7.35E+04	6.30E+06	7.35E+04

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant, H (atm-m ³ /mol)	Henry's reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., RIC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.47E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.44E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	685.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.79E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	6.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84562 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	6 37E-05	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	5 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87685 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+00	1 86E-07	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	1 58E+02	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	2 60E+04	7 79E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	0 0E+00
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98563 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	1 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	2 76E-03	25	418 31	636 00	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 43E-03	25	441 52	616 20	8,525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	417 52	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	358 65	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 55	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108683 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 63E-06	1 72E+04	7 38E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 32E-05	25	825 00	14,447	14,447	4 6E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	4 42E-03	25	482 15	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E-02	3 80E-06	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
127164 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	8 29E-07	25	655 95	905 00	13,815	0 0E+00	1 4E-01
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 58E-03	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 10E-05	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 26E-02	5 66E-06	8 00E-04	3 40E-05	8 29E-07	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	6 97E-03	9 46E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	2 00E+00	4 35E-04	1 06E-05	25	588 00	770 00	12,938	1 9E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E-01	4 67E-01	7 46E-07	25	558 00	770 00	11,000	2 0E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 46E-07	25	588 00	770 00	11,000	2 0E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	9 51E-06	25	613 96	848 76	13,000	2 8E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	657 15	873 31	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	402 50	539 37	19,000	1 0E-04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	512 27	500 00	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53489219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041276

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

cis-1,2-Dichloroethylene

156592

7 6425

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	701.04	304.8	1066.8		C	S	SI

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil water-filled porosity, n^A (unitless)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (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

Used to calculate risk-based
groundwater concentration

1017

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$)	Reference conc., R/C (mg/m^3)
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

7041278

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+09	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, η_{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_{seam} (cm)
Area of enclosed space below grade, A_g (cm^2)	5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	4.56E-04	5.24E-04	6.94E-04	2057.64
			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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{TS}^{-1} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)			Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Average vapor flow rate into bldg, Q_{avg} (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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m ³)			
	15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	3.77E-06	4.32E-04	NA	3.5E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
NA	$8.45\text{E}+04$	$8.45\text{E}+04$	$3.50\text{E}+06$	$8.45\text{E}+04$

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _w (cm ² /s)	D _a (cm ² /s)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.088	0.0092	0.0092	0.083	0.38	0.088	0.0092	0.083	0.38	0.088	0.0092	0.083
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.237	0.41	0.095	0.016	0.237	0.41	0.095	0.016	0.237
LC	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.020	0.359	0.43	0.078	0.020	0.359	0.43	0.078	0.020	0.359
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.040	0.561	0.41	0.057	0.040	0.561	0.41	0.057	0.040	0.561
S	29.70	0.145	2.66	0.627	0.43	0.045	0.044	0.044	0.627	0.43	0.045	0.044	0.627	0.43	0.045	0.044	0.627
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.025	0.025	0.187	0.38	0.025	0.025	0.187	0.38	0.025	0.025	0.187
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.324	0.39	0.100	0.029	0.324	0.39	0.100	0.029	0.324
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.270	0.46	0.034	0.0046	0.270	0.46	0.034	0.0046	0.270
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.083	0.26	0.070	0.0039	0.083	0.26	0.070	0.0039	0.083
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.187	0.43	0.089	0.0056	0.187	0.43	0.089	0.0056	0.187
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.291	0.45	0.067	0.011	0.291	0.45	0.067	0.011	0.291
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.030	0.471	0.41	0.065	0.030	0.471	0.41	0.065	0.030	0.471

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ² /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	595.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.54E-06	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
692E+00	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71333	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	3.10E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E-03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	385.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83328	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84962 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	587 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85887 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 17E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	2 61E+00	2 81E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87883 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 80E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-04	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E-00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 45E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95854 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	2 76E-03	25	418 31	636 00	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	684 75	8,525	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	358 65	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	452 02	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	8 70E-06	8 28E-04	1 63E-05	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E-04	7 38E-04	1 02E-07	25	674 43	942 94	14,000	0 0E+00	2 1E-02
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 00E-01	4 18E-06	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	482 15	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	11,000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrofluorene	9 55E+01	2 03E-01	7 06E-06	2 70E-02	3 80E-06	9 27E-08	25	416 14	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	394 40	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	687 95	938 00	14,370	0 0E+00	1 1E-01
128000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
156505 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	4 55E-03	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 60E-06	25	655 95	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	1 61E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 43E+08	1 32E-02	4 86E-06	1 80E-03	6 97E-03	1 06E-05	25	596 55	839 36	13,000	5 3E-04	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	25	381 15	587 38	7,000	3 7E-05	0 0E+00
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	558 00	770 00	12,938	1 9E-04	2 0E-02
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	509 60	748 87	11,000	2 0E-03	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	613 96	848 76	13,000	2 8E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	5 20E+01	3 07E-02	6 30E-06	5 82E-02	4 67E-01	9 51E-06	25	628 88	1750 00	14,127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	2 57E+05	1 18E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
8001352 Toxaphene	1109625 Aroclor 1260 (PCB-1260)	1 56E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097891 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041282

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

Carbon tetrachloride

56235 31 392

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072.64	701.04	304.8	1066.8		C	S	SI	

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER Averaging time for carcinogens, ATc (yrs)	ENTER Averaging time for noncarcinogens, ATnc (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1.07

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., R/C (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum A soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.46E-03	7.99E-04	4.74E-04	5.46E-04	7.23E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{rad} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc, RfC (mg/m^3)
15	8.53E+02	0.10	6.67E-01	3.16E-03	3.84E+02	3.77E+03	3.88E-06	3.31E-03	1.5E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
4.91E+01	NA	4.91E+01	7.93E+05	4.91E+01

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _w (cm ² /s)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092									
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016									
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020									
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040									
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044									
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025									
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029									
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046									
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039									
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056									
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011									
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030									

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E+06	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-07	6.03E-07	1.47E-08	25	743.24	980.41	16,000	2.1E-03	0.0E+00
55235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55653	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.54E-06	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65650	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	3.88E-05	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-03	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	895.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.0E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	860.38	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	3.10E+04	8.98E-02	1.60E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	2.98E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	383.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 88	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+03	3 63E-02	7 88E-06	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
87748 Carbazole	3 39E+03	3 90E-02	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87883 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 10E-06	1 95E+03	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91941 3,3'-Dichlorobenzidine	7 24E+02	1 94E-02	3 11E+00	1 64E-07	4 83E-04	25	491 14	748 04	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	1 78E+02	2 13E-01	5 20E-03	25	417 60	754 03	13 000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	2 60E+04	4 92E+05	1 20E-06	25	464 19	697 60	8 661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 80E+03	2 91E-02	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	1 8E-02
98953 Nitrobenzene	6 46E+01	7 60E-02	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E-03
100425 Styrene	7 76E+02	7 10E-02	3 10E+02	1 13E-01	2 70E-03	25	418 13	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	1 85E+02	3 14E-01	7 68E-03	25	411 52	616 20	8 525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 38E+01	9 96E-02	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	5 30E+03	1 36E-05	2 43E-03	25	47 21	684 75	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	8 52E+03	4 01E-02	9 78E-03	25	356 65	561 00	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	8 28E+04	1 83E-05	1 80E-05	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 12E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 16E-02	4 55E-06	5 10E-01	1 02E-07	25	657 15	806 00	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	6 88E-05	25	704 09	862 22	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	1 02E-07	25	582 55	825 00	14 447	4 6E-04	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	5 41E-02	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	4 34E-02	2 67E-03	1 32E-03	25	482 15	725 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	3 00E-02	5 82E-02	1 42E-03	25	486 15	708 17	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	4 50E+03	1 30E-04	3 17E-06	25	590 00	814 00	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	2 70E+02	3 80E-06	9 27E-08	25	416 14	678 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	2 60E+03	3 21E-02	7 83E-04	25	394 40	620 20	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	2 00E+02	7 54E-01	1 84E-02	25	367 95	936 00	14 370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-08	1 35E-01	1 10E-05	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	1 90E-02	2 20E+05	6 58E-05	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	2 26E-02	1 13E-05	4 55E-03	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	2 00E-01	6 60E-04	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	8 00E-04	3 40E-05	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E-01
208440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	1 61E-05	25	753 15	1019 70	16 455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	1 60E-03	6 97E-03	9 46E-05	25	603 01	839 37	13 000	4 8E-03	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	2 00E+00	4 38E-04	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
309002 Aldrin	3 19E+03	1 42E-02	2 40E+01	3 05E-05	1 06E-05	25	587 38	770 00	7 000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	2 40E+01	3 05E-05	1 06E-05	25	587 38	770 00	7 000	3 7E-05	2 0E-02
319857 beta-HCH (beta-BHC)	4 57E+01	6 26E-02	2 80E+03	7 28E-01	1 77E-02	25	558 00	770 00	12 938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	6 92E+01	3 27E-02	1 82E+02	3 06E-05	7 46E-07	25	509 60	746 87	11 000	2 0E-03	0 0E+00
60202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	9 89E+03	9 23E-05	2 25E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	1 32E-02	4 23E-06	3 90E-04	9 51E-06	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
1024573 Heptachlor epoxide	5 20E+01	3 07E-02	5 82E-02	4 67E-01	1 14E-02	25	657 15	873 31	14 000	3 2E-04	0 0E+00
7439976 Mercury (elemental)	2 57E+05	1 16E-02	7 40E-01	2 48E-04	6 00E-06	25	402 50	539 37	19 000	1 0E-04	0 0E+00
8001352 Toxaphene	2 90E+05	1 38E-02	8 00E-02	1 89E-01	4 60E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	3 00E+05	1 58E-02	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	3 30E+04	2 22E-02	4 20E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)											
53469219 Aroclor 1242 (PCB-1242)											

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

Bromodichloromethane

75274 4 1516

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{wt} (cell D28)	Soil stratum directly above water table, (Enter A, B, or C)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)
16	15	2072.64	701.04	304.8	1066.8		C	S

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{encl} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

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

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
2.98E-02	1.06E-05	1.60E-03	25	7,000	363.15	585.85	5.50E+01	6.74E+03	1.8E-05	0.0E+00

7041230

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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)
9.46E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.740	6.98E-10	17.05	0.43	0.136	0.294	3.844

Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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} (unitless)	Henry's law constant at ave. groundwater temperature, H'_{ts} (unitless)	Vapor viscosity at ave soil temperature, μ_{ts} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.723	1.07E-03	4.49E-02	1.77E-04	1.21E-03	3.22E-04	2.04E-04	2.30E-04	3.05E-04	2057.64

Convection path length, L_p (cm)	Source vapor conc, C_{source} (ug/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{total} (cm ³ /s)	Crack effective diffusion coefficient, D^{eff}_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Peclet number, $\exp(Pe')$ (unitless)	Infinite source bldg conc, $C_{building}$ (ug/m ³)	Infinite indoor attenuation coefficient, α (unitless)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, RIC (mg/m ³)
15	4.49E+01	0.10	6.67E-01	1.21E-03	3.84E+02	2.07E+09	9.07E-05	2.02E-06	1.8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.49E+03	NA	1.49E+03	6.74E+06	1.49E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.58	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SL	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant temperature, H (atm·m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	989.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	15,000	16,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	7,127	1.5E-05	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	15,000	2.1E-04	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	13,000	3.7E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	598.55	839.36	13,000	4.6E-03	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.54E-06	25	613.32	842.25	10,000	0.0E+00	1.4E-01
65850	Benzoic Acid	6.00E-01	3.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	6,955	0.0E+00	3.5E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,988	2.3E-05	0.0E+00
67683	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	9,510	4.0E-06	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	10,346	0.0E+00	3.5E-01
71363	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.0E-02
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72548	DDD	1.00E+06	1.68E-02	4.78E-06	9.00E-02	1.64E-04	4.00E-06	25	276.71	487.00	5,714	0.0E+00	5.0E-03
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	319.00	510.00	6,706	4.7E-07	3.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	313.00	510.00	6,391	0.0E+00	7.0E-01
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	330.55	523.00	6,247	5.0E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	304.75	576.05	13,000	1.3E-03	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	603.69	846.31	10,931	2.7E-07	0.0E+00
75354	1,1,1,1-Tetrachloroethane	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	512.15	746.00	10,271	2.7E-07	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	488.35	715.00	7,590	0.0E+00	4.0E-03
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	369.52	572.00	8,322	1.6E-05	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	386.15	602.00	7,505	1.7E-06	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	419.60	681.15	12,155	0.0E+00	2.1E-01
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	550.54	803.15			
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25					
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25					
83329	Acenaphthene	7.08E+03	4.21E-02	7.90E-06	4.24E+00	6.36E-03	1.54E-04	25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E+01
85087 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	860 60	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	3 23E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-08	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	417 60	754 03	13,000	1 3E-04	0 0E+00
93476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	526 15	759 13	13,000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-08	25	483 95	719 00	10,566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	418 31	636 00	8,501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	2 76E-03	25	484 13	707 60	11,329	0 0E+00	7 0E-02
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	412 27	617 20	8,525	0 0E+00	8 0E-01
105678 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 65E+02	3 14E-01	3 32E-07	25	365 65	561 00	7,643	2 6E-05	0 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 80E-06	5 30E+03	1 38E-05	6 83E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 61E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	519 13	7,800	0 0E+00	2 0E-01
107062 1,2-Dichloroethane	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108863 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 83E-03	25	404 87	632 40	9,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-allylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 8E-04	0 0E+00
120127 Anthracene	2 96E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	1 84E-02	25	394 40	620 20	8,288	5 9E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	3 50E+03	1 67E-01	4 07E-03	25	330 85	544 00	7,192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	6 30E+03	3 85E-01	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
156805 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	6 56E-05	1 80E-06	25	715 90	969 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	6 80E-04	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	1 8E-03	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodiphenylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
11095825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
		2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041294

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

75014 22 33434783

Vinyl chloride (chloroethene)

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg space pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., R(C) (mg/m^3)
1.06E-01	1.23E-06	2.71E-02	25	5,250	259.25	432.00	1.86E+01	2.76E+03	8.4E-05	0.0E+00

7041296

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A 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_{seam} (cm)
9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.120	0.294	3.844
Bldg ventilation rate, Q_{venting} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm^2/s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm^2/s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	4.933	2.09E-02	8.81E-01	1.77E-04	4.29E-03	1.08E-03	0.00E+00	6.02E-04	1.71E-03	2331.96
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vld} (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, $\exp(\text{Pe})$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{building} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
15	8.81E+02	0.10	5.70E-01	4.29E-03	3.84E+02	1.78E+02	5.51E-06	4.86E-03	8.4E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
5.96E+00	NA	5.96E+00	2.76E+06	5.96E+00

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _r (cm ³ /cm ³)	Mean Grain Diameter (cm)		
C	0.20	0.008	1.09	0.083	0.38	0.088	0.0092		
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016		
IL	1.04	0.036	1.56	0.359	0.43	0.078	0.020		
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040		
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044		
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025		
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029		
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046		
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039		
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056		
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011		
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030		

Chemical Properties Lookup Table														
CAS No.	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, UR _F (μg/m ³) ⁻¹	Reference conc. R _{IC} (mg/m ³)	
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03	0.0E+00
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00	0.0E+00
66850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01	0.0E+00
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.9E-01	0.0E+00
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,348	0.0E+00	3.5E-01	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E-01	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00	0.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03	0.0E+00
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,708	4.7E-07	3.0E+00	0.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	0.0E+00
75252	Bromotom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-06	0.0E+00	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	620.00	8,322	1.6E-05	0.0E+00	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.80	661.15	8,986	5.8E-05	0.0E+00	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	0.0E+00

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E+10	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-05	890 45	13,000	1 4E+06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	7 48E+00	6 26E-07	6 37E-05	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	3 23E+00	3 34E-01	1 53E-08	899 00	13,977	5 7E+06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	10,206	10,206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14,000	3 4E+05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12,000	3 1E+06	0 0E+00
91203 Naphthalene	7 24E+02	1 94E-02	6 74E-06	3 10E+01	1 98E-02	4 83E-04	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	7 78E-06	754 03	13,000	1 3E+04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	759 13	13,000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	707 60	11,329	0 0E+00	7 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	684 75	9,271	0 0E+00	8 0E+01
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	754 00	11,689	0 0E+00	1 4E+02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	5 30E+03	1 38E-05	3 32E-07	519 13	7,800	0 0E+00	2 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	7 38E+01	9 98E-02	2 43E-03	671 05	8,523	0 0E+00	7 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	591 79	7,930	0 0E+00	4 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	632 40	8,410	0 0E+00	2 0E+02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	694 20	10,920	0 0E+00	2 1E+02
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 98E-07	825 00	14,447	0 0E+00	7 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 27E+04	1 52E-01	3 71E-03	659 79	9,000	3 3E-04	0 0E+00
108952 Phenol	8 20E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	942 94	14,000	0 0E+00	2 1E+02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 12E-05	808 00	15,999	4 0E+06	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 02E-07	862 22	15,000	0 0E+00	7 0E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E+01	4 18E-06	6 88E-05	825 00	13,121	0 0E+00	1 1E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	5 42E-02	6 20E+00	5 41E-02	6 51E-05	725 00	10,471	0 0E+00	2 0E+01
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	4 34E+02	2 67E-03	1 42E-03	814 00	11,000	0 0E+00	1 1E+02
120127 Anthracene	2 98E+04	3 24E-02	7 74E-06	4 50E+03	3 00E-04	3 17E-06	620 20	8,288	5 8E-07	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	2 70E+02	3 80E-06	9 27E-08	678 20	8,000	2 4E-05	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 21E-02	7 83E-04	708 17	13,467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814 00	11,000	0 0E+00	1 1E+02
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	7 54E-01	1 84E-02	620 20	8,288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	936 00	14,370	0 0E+00	1 1E+01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	544 00	7,192	0 0E+00	3 5E+02
156892 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 65E-01	9 39E-03	989 27	15,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E+05	6 56E-05	1 60E-06	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 61E-05	905 00	13,815	0 0E+00	1 4E+01
206440 Fluoranthene	3 02E-02	3 02E-02	6 35E-06	2 06E-01	6 60E-04	8 29E-07	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 46E-05	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	770 00	12,938	1 9E-04	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	7 46E-07	848 76	11,000	2 0E+03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 70E-04	839 37	13,000	4 9E+03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	839 36	13,000	1 8E+03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	3 05E-05	7 44E-07	839 36	13,000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	7 26E-01	1 77E-02	587 38	7,000	3 7E+05	2 0E+02
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	3 06E-05	7 46E-07	770 00	12,938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 23E-05	2 25E-06	746 87	11,000	2 0E+03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	848 76	13,000	2 6E+03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	1 14E-02	1750 00	14,127	0 0E+00	3 0E+04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 34E-06	8 00E-02	4 60E-04	6 00E-06	873 31	14,000	3 2E+04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	1 89E-01	4 60E-06	539 37	19,000	1 0E+04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	8 20E-02	2 00E-03	512 27	19,000	1 0E+04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	475 22	18,000	1 0E+04	0 0E+00
							482 20	18,000	1 0E+04	0 0E+00

7041300

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

67663 24 15217391

Chloroform

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{WT} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	0	B	S	C	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1.0E-06

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RIC (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	2.3E-05	0.0E+00

7041302

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_a (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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_{seam} (cm)
9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.48E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Bldg ventilation rate, Q_{building} (cm^3/s)	Area of enclosed space below grade, A_g (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	0.00E+00	6.00E-04	1.69E-03	2331.96
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{rad} (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, $\exp(\text{Pe})$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{building} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
15	1.04E+02	0.10	5.70E-01	4.22E-03	3.84E+02	1.96E+02	5.48E-06	5.70E-04	2.3E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater carcinogen (µg/L)	Indoor exposure groundwater 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)
1.86E+02	NA	1.86E+02	7.92E+06	1.86E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.088
CL	0.26	0.019	1.31	0.237	0.095
L	1.04	0.038	1.56	0.359	0.078
LS	14.59	0.124	2.28	0.561	0.040
S	29.70	0.145	2.68	0.627	0.044
SC	0.12	0.027	1.23	0.187	0.025
SCL	1.31	0.059	1.48	0.324	0.100
SI	0.25	0.016	1.37	0.270	0.034
SIC	0.02	0.005	1.09	0.083	0.070
SICL	0.07	0.010	1.23	0.187	0.089
SIL	0.45	0.020	1.41	0.291	0.067
SL	4.42	0.075	1.89	0.471	0.065

Chemical Properties Lookup Table											
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant in water, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	2.49E-07	4.44E-07	25	605.28	827.85	15,000
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	558.60	7,127
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	598.55	839.36	13,000
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+08	1.59E-03	3.88E-05	25	329.20	508.10	6,955
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342
71555	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	278.71	467.00	5,714
75014	Vinyl chloride (chloroethane)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-02	25	259.25	432.00	5,250
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	3.08E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,706
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	383.15	585.85	7,000
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895
75354	1,1,2-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.53E-04	25	550.54	803.15	12,155

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 09E-04	3 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+03	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+03	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-03	25	582 15	738 00	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
93476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	13,000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	10,566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 69E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	2 00E+04	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethoxyethyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 00E-01	4 18E-08	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 86E-06	25	704 09	882 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
121142 2,4-Dinitrotoluene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+03	3 21E-02	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 19E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Arcorol 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097681 Arcorol 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Arcorol 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Arcorol 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☐ X ☐

OR

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

YES ☐

ENTER Initial groundwater conc., C_w ($\mu\text{g/L}$)

Chemical CAS No (numbers only, no dashes)

Chemical

79016 1834 652174

Trichloroethylene

ENTER Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	0	B	S	C

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{space} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1

ENTER Averaging time for carcinogens, AT_{nc} (yrs)	ENTER Averaging time for noncarcinogens, AT_{nc} (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

Used to calculate risk-based groundwater concentration

107

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{yr}$) ⁻¹	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fa} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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 permeator, X_{crack} (cm)
9.48E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.120	0.294	3.844
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm ² /s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm ² /s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	0.00E+00	4.52E-04	1.28E-03	2331.96
Convection path length, L_p (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 number, $\exp(Pa)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RIC (mg/m ³)			
15	2.78E+02	0.10	5.70E-01	3.20E-03	3.84E+02	1.05E+03	4.76E-06	1.32E-03	1.7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater 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)
1.08E+03	NA	1.08E+03	1.10E+06	1.08E+03

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0032
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant reference temperature, T _A (°C)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	2.79E-03	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	25	349.90	556.60	7,127	1.5E-05	0.0E+00
55553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-04	6.19E-04	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	25	458.00	895.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	25	319.00	552.00	6,391	7.0E-01	0.0E+00
75232	Bromoform	8.71E+01	1.49E-01	1.03E-05	3.10E+03	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	25	330.55	523.00	6,895	5.0E-01	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	25	603.69	848.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 87	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-06	0 0E+00
88062 2,4,6-Trichlorophenol	3 18E+02	3 18E-02	6 29E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91841 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95478 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 13E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,568	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 08E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	9 96E-02	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	581 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	404 87	632 40	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 63E-06	3 98E-07	25	451 15	659 79	9,000	0 0E+00	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	2 18E-06	1 02E-07	25	657 15	806 00	15,959	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	882 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-05	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	665 95	905 00	13,815	0 0E+00	1 4E-01
218019 Chrysene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 46E-02	6 21E-06	1 60E-03	3 88E-03	9 48E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	2 25E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 51E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041312

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

79005 26 19434783

1,1,2-Trichloroethane

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Thickness of soil stratum A, h_a (cm)	ENTER Thickness of soil stratum B, h_b (cm)	ENTER Thickness of soil stratum C, h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	1173 48	0	B	S	C	

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{rock} (cm)	ENTER Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target risk for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., R(C) (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)	Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)	Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_i (cm ²)	Stratum A soil relative permeability, k_{rg} (cm ²)	Stratum A effective vapor permeability, k_e (cm ²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, η_{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)
9.48E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, H_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm ² /s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm ² /s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	9.507	5.53E-04	2.33E-02	1.77E-04	3.17E-03	8.25E-04	0.00E+00	4.79E-04	1.29E-03	2331.96
Convection path length, L_p (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 number, $\exp(Pe')$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m ³)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)			
15	2.33E+01	0.10	5.70E-01	3.17E-03	3.84E+02	1.12E+03	4.79E-06	1.12E-04	1.6E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.36E+03	NA	1.36E+03	4.42E+06	1.36E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/hr)	α (1/cm)	N (unitless)	M (unitless)	D _w (cm ² /s)	D _a (cm ² /s)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H ¹ (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H ¹ (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.48E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	586.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.85E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	8.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDO	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.08E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.18E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromochloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 03E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	2 35E+00	3 34E-01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87985 Pentachlorophenol	9 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-08	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	7 05E-06	3 10E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	6 33E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	2 60E+04	4 92E-05	1 20E-06	1 90E-03	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	25	526 15	759 13	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	7 88E-03	25	409 34	619 00	10 566	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 68E+02	3 23E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	7 0E-02
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E-02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E-02
108957 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 72E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 32E-03	25	582 55	825 00	13 121	0 0E+00	1 1E-00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	25	615 18	873 00	10 471	0 0E+00	2 0E-01
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	1 84E-02	25	416 14	678 20	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	9 55E+01	2 03E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	394 40	620 20	8 288	5 8E-07	0 0E+00
121142 2,4-Dinitrotoluene	6 31E+01	1 96E-02	1 05E-05	2 70E+02	7 54E-01	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	3 85E-01	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	8 29E-07	25	655 95	905 00	13 815	0 0E+00	1 4E-01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	25	320 85	516 50	16 455	2 1E-06	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 55E-03	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	4 35E-04	9 48E-05	25	598 55	839 36	13 000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	7 44E-07	25	603 01	839 37	13 000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	598 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	598 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
605202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	25	558 00	770 00	12 838	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 27	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041313

DATA ENTRY SHEET

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

VERSION 1.2
September, 1998YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

127184 18 24217391

Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wr} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wr} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
18	15	2346 96	1173 48	1173 48	0	0	B	S	C

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_f (cm)	ENTER Enclosed space width, W_f (cm)	ENTER Enclosed space height, H_f (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., R/C (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.128	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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 permeometer, X_{crack} (cm)
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
	5.63E+04	9.24E+05	4.16E-04	15	9.492	1.12E-02	4.71E-01	1.77E-04	2.92E-03	7.38E-04	0.00E+00	4.11E-04	1.16E-03	2331.96
Convection path length, L_p (cm)		Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{bldg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-s}$)	Reference conc., RIC (mg/m ³)			
	15	4.71E+02	0.10	5.70E-01	2.92E-03	3.84E+02	2.06E+03	4.52E-06	2.13E-03	5.8E-07	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.97E+03	NA	1.97E+03	2.00E+05	1.97E+03

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057
S	29.70	0.145	2.68	0.627	0.43	0.045
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.065

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.29E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.85E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	3.10E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,708	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-08	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
89062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	10,373	0 0E+00	1 4E-01
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 11E+01	1 84E-07	4 83E-04	25	491 14	748 40	13,000	1 3E-04	0 0E+00
91941 3,3-Dichlorobenzidine	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95476 o-Xylene	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	705 00	10,800	0 0E+00	1 8E-01
95487 2-Methylphenol (o-cresol)	9 5501 1.2-Dichlorobenzene	6 17E+02	6 90E-02	1 56E+02	7 79E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 45E-06	2 20E+04	1 60E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	26	411 52	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 5E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	1 05E-06	2 00E-02	2 74E-03	6 88E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	13,121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	10,471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 88E-01	1 60E-06	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	1 61E-05	8 29E-07	25	655 95	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 16E-05	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-04	1 46E-05	25	603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	3 19846 alpha-HCH (alpha-BHC)	1 26E+03	1 42E-02	7 34E-08	2 00E+00	1 06E-05	25	596 55	839 36	13,000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	5 42756 1,3-Dichloropropene	4 57E+01	6 28E-02	1 00E-05	2 80E+03	7 44E-07	25	587 38	870 00	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	2 25E-06	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 87E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041324

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

79345 2228 043478

1,1,2,2-Tetrachloroethane

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade to bottom of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Thickness of soil stratum A, h_A (cm)		Thickness of soil stratum B, h_B (cm)		Thickness of soil stratum C, h_C (cm)	
16	15	2346	96	1173	48	1173	48	0	0	0	0

ENTER		ENTER		ENTER		ENTER		ENTER	
Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v (cm^2)		Soil stratum B SCS soil type directly above water table, (Enter A, B, or C)		Soil stratum C SCS soil type directly above water table		Soil stratum A SCS soil type directly above water table		Soil stratum A SCS soil type directly above water table	

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)		Stratum A soil total porosity, n^A (unitless)		Stratum B soil dry bulk density, ρ_s^B (g/cm^3)		Stratum B soil total porosity, n^B (unitless)		Stratum C soil dry bulk density, ρ_s^C (g/cm^3)		Stratum C soil total porosity, n^C (unitless)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	0.3	0.3	0.3

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{crack} (cm)		Enclosed space floor length, L_g (cm)		Enclosed space floor width, W_g (cm)		Enclosed space height, H_g (cm)		Floor-wall seam crack width, w (cm)		Indoor air exchange rate, ER (1/h)	
15	40	961	961	961	488	488	0.1	0.45	0.45	0.45	0.45

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

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$) ⁻¹	Reference conc., R/C (mg/m^3)
7.10E-02	7.90E-06	3.44E-04	25	8.996	419.60	661.15	9.33E+01	2.97E+03	5.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fa} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ra} (cm^2)	Stratum A 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_{seam} (cm)
Bldg. ventilation rate, $Q_{building}$ (cm^3/s)		Area of enclosed space below grade, A_g (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'_{rs} (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	10.480	1.98E-04	8.36E-03	1.77E-04	2.90E-03	7.95E-04	0.00E+00	4.94E-04	1.23E-03	2331.96
			Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{sol} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{yr}^{-1}$)	Reference conc., RfC (mg/m ³)			
			Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)											
15	8.36E+00	0.10	5.70E-01	2.90E-03	3.84E+02	2.15E+03	4.67E-06	3.91E-05	5.8E-05	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.07E+03	NA	1.07E+03	2.97E+06	1.07E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.063	0.38	0.063	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.065	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (μ g/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.80	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	4.37E-02	4.37E-06	1.99E-03	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	4.6E-03	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
66850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E-01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethane)	1.86E+01	1.06E-01	1.23E-06	2.76E-04	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E-04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E-03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	2.98E-02	1.34E-05	3.10E-03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	595.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	5.0E-05	0.0E+00
75354	1,1,2-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	368.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	355.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.87E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 89E-08	9 39E-10	798 67	14 751	0 0E+00	3 5E-01
85987 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	838 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	12 666	0 0E+00	1 4E-01
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	870 00	13 977	0 0E+00	1 4E-01
87748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	899 00	13 977	0 0E+00	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	2 35E+00	3 34E-01	8 15E-03	738 00	10 206	2 0E+00	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-07	4 83E-04	748 00	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	3 90E-04	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	707 60	11 329	0 0E+00	7 0E-02
105879 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 66E-03	636 00	8 525	0 0E+00	0 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	684 75	9 271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 90E+01	9 96E-02	3 32E-07	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	9 78E-04	561 00	7 643	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	519 13	7 800	0 0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	7 34E-03	617 05	8 523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	6 63E-03	591 79	7 930	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	3 98E-07	632 40	8 410	0 0E+00	2 0E-02
108907 Chlorobenzene	2 18E+02	7 30E-02	9 10E-06	4 72E+02	1 52E-01	3 71E-03	894 20	10 920	0 0E+00	2 1E-02
111444 Bis(2-chloroethyl)ether	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 12E-05	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	2 14E+03	1 15E-02	4 65E-06	5 10E-01	4 59E-04	1 02E-07	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	1 32E-03	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	6 51E-05	873 00	13 121	0 0E+00	1 1E-01
120821 1,2,4-Trichlorobenzene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	1 42E-05	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	3 17E-06	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	9 27E-08	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	7 83E-04	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	1 10E-05	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	936 00	14 370	0 0E+00	1 1E-01
155592 cis-1,2-Dichloroethylene	1 05E+05	2 72E-02	1 24E-06	1 33E-01	4 51E-04	4 07E-03	544 00	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	9 39E-03	516 50	7 192	0 0E+00	3 5E-02
193395 Indeno(1,2,3-cd)pyrene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	1 60E-06	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	3 47E+06	1 90E-02	5 66E-06	2 20E+03	6 56E-05	1 11E-04	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 00E-01	6 60E-04	8 29E-07	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	9 48E-05	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	8 00E-04	3 40E-05	1 70E-04	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 60E-03	3 88E-03	1 08E-05	839 36	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 40E-01	3 05E-05	7 77E-02	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	8 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	770 00	12 938	1 9E-04	0 0E+00
821647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 50	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	482 20	18 000	1 0E-04	0 0E+00

7041330

VLOOKUP TABLES

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

78875 27 7888889

1,2-Dichloropropane

ENTER Average groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, (Enter value or 0) h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm^2)
16	15	2346.96	1173.48	1173.48	0	0	B	S	C

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil water-filled porosity, $\theta_{w,A}$ (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RTC (mg/m^3)
7.82E-02	8.73E-06	2.80E-03	25	7.590	369.52	572.00	4.37E+01	2.80E+03	0.0E+00	4.0E-03

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_A^* (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_B^* (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_C^* (cm^3/cm^3)	Stratum A soil effective total fluid saturation, S_{se} (cm^3/cm^3)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam penmeter, X_{seam} (cm)
9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	5.97E-10	17.05	0.42	0.126	0.294	3.844
Bldg ventilation rate, Q_{bldg} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D_A^{eff} (cm^2/s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm^2/s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm^2/s)	Capillary zone effective diffusion coefficient, D_{ca}^{eff} (cm^2/s)	Total overall effective diffusion coefficient, D_T^{eff} (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.566	1.79E-03	7.52E-02	3.17E-03	8.08E-04	0.00E+00	4.55E-04	1.27E-03	2331.96
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., $Q_{v,bldg}$ (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc, RIC (mg/m ³)			
15	7.52E+01	0.10	5.70E-01	3.17E-03	3.84E+02	1.12E+03	4.75E-06	NA	4.0E-03			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
NA	1.17E+04	1.17E+04	2.80E+06	1.17E+04

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

INCREMENTAL RISK CALCULATIONS

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

LOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	Soil Properties Lookup Table			θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.088	0.0092	
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	
SSC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	
SL	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	
SIL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_v (cal/mol)	Unit risk factor, URF (μ g/m ³) ¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
66553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.0E+00	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	7.55E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.5E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Buland	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	8.80E-06	1.75E+03	2.28E-01	5.66E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.76E-06	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.99E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isothorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	366.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E-02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	5.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567.15	757.00	13.733	0.0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	613.15	798.67	14.751	0.0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 26E-06	660.60	839.68	13.000	0.0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 38E-06	3 51E+01	2 05E-04	5 00E-06	832.28	890.45	13.000	1 4E-06	0 0E+00
86737 Fluorane	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570.44	870.00	12.666	0.0E+00	1 4E-01
86748 Carbazole	3 39E+04	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627.87	899.00	13.977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	488.15	738.00	10.206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582.15	813.20	14.000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 28E-06	8 00E+02	3 19E-04	7 78E-06	519.15	749.03	12.000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	491.14	748.40	10.373	0.0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	560.26	754.03	13.000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 13E+01	1 78E-02	5 20E-03	417.60	630.30	8.661	0.0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	464.19	697.60	10.800	0.0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	453.57	705.00	9.700	0.0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	447.53	675.00	9.572	0.0E+00	1 8E-02
99594 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	526.15	759.13	13.000	0.0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	483.95	719.00	10.566	0.0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 10E-02	8 09E-06	3 10E+02	1 13E-01	7 88E-03	409.34	617.20	8.501	0.0E+00	1 0E+00
100425 Styrene	7 76E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	418.31	636.00	8.737	0.0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	7 66E-03	411.52	616.20	8.525	0.0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 83E+02	3 14E-01	2 43E-03	427.21	684.75	9.271	0.0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	503.65	754.00	11.689	0.0E+00	1 4E-02
106478 p-Chloroaniline	6 81E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	355.65	561.00	7.643	2 8E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	519.13	780.00	7.800	0.0E+00	2 0E-01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	412.27	617.05	8.523	0.0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	383.78	591.79	7.930	0.0E+00	4 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	404.87	632.40	8.410	0.0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	455.02	694.20	10.920	0.0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	451.15	659.79	9.000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	674.43	942.94	14.000	0.0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	657.15	806.00	15.999	4 0E-06	0 0E+00
117517 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	825.00	825.00	14.447	4 8E-04	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	704.09	862.22	15.000	0.0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	582.55	825.00	14.447	4 8E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	6 51E-05	815.18	873.00	13.121	0.0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486.15	725.00	10.471	0.0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	590.00	814.00	11.000	0.0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	814.00	814.00	13.467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	416.14	678.20	8.000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	7 54E-01	1 84E-02	394.40	620.20	8.288	5 8E-07	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	1 10E-05	667.95	936.00	14.370	0.0E+00	1 1E-01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	320.85	516.50	17.000	2 1E-04	0 0E+00
193395 Indenol(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	809.15	1078.24	16.455	2 1E-05	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	715.90	969.27	15.000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	2 26E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	655.95	905.00	13.815	0.0E+00	1 4E-01
207088 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	753.15	979.00	16.000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	714.15	979.00	16.455	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 87E-03	1 70E-04	603.01	839.37	13.000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	596.55	839.36	13.000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	596.55	839.36	13.000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381.15	587.38	7.000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	558.00	770.00	12.938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509.60	748.87	11.000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	613.96	848.76	13.000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	629.88	1750.00	14.127	0.0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	657.15	873.31	14.000	3 2E-04	0 0E+00
11095825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 34E-06	8 00E-02	1 89E-01	4 60E-03	402.50	539.37	19.000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377.50	512.27	19.000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	340.50	475.22	18.000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	345.50	482.20	18.000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

15605 23 575

Chemical

trans-1,2-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Thickness of soil stratum directly above water table, (Enter A, B, or C)	Soil stratum directly above water table (Enter A, B, or C)	SCS soil type directly above water table	SCS soil type water table permeability, k_v (cm^2)
16	15	2346.96	1173.48	1173.48	0	B	S	C	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
15	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Enclosed space length, L_g (cm)	Enclosed space width, W_g (cm)	Enclosed space height, H_g (cm)	Enclosed space width, w (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for cardiogens, ATC (yrs)	Averaging time for noncardiogens, ATNC (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for cardiogens, TR (unitless)	Target hazard quotient for noncardiogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

7041338

CHEMICAL PROPERTIES SHEET

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, ΔH_b (cal/mol)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc. RfC (mg/m ³)
7.07E-02	1.19E-05	9.39E-03	25	6.717	320.85	516.50	5.25E+01	6.30E+03	0.0E+00	7.0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Source-building separation, L_r (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A soil relative permeability, k_{ra} (cm^2)														
Stratum A 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_{seam} (cm)														
Bldg ventilation rate, Q_{bldg} (cm^3/s)														
Area of enclosed space below grade, A_g (cm^2)														
Crack-to-total area ratio, η (unitless)														
Crack depth below grade, Z_{crack} (cm)														
Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)														
Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)														
Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)														
Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)														
Total overal effective diffusion coefficient, D^{eff}_T (cm^2/s)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg, $Q_{v,bldg}$ (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)														
Area of crack, A_{crack} (cm^2)														
Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)														
Indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc, C_{bldg} ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹														
Reference conc., RfC (mg/m ³)														
Conc., RfC (mg/m ³)														
15	2.73E+02	0.10	5.70E-01	2.87E-03	3.84E+02	2.36E+03	4.48E-06	1.22E-03	NA	7.0E-02				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
NA	5.97E+04	5.97E+04	6.30E+06	5.97E+04

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

INCREMENTAL RISK CALCULATIONS:

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ² /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°C)	Critical temperature, T_c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (ug/m ³) ⁻¹	Reference conc, RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
55235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-00	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-03	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
87641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
87663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
87721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.98E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	552.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	596.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	8.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E-04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.19E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

7041342

VLOOKUP TABLES

84862 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 28E-06	890 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	8 15E-03	486 15	738 00	10 206	2 2E-05	0 0E+00
87665 Pentachlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+06	3 19E-04	2 44E-08	582 15	813 20	14 000	3 4E-05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	7 78E-06	519 15	749 03	12 000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 83E-04	491 14	748 00	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	7 05E-06	2 60E+04	4 92E-05	1 20E-06	457 57	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+02	7 79E-02	1 90E-03	25 453 57	707 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	1 79E-02	3 90E-04	447 53	675 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	4 34E-06	528 15	759 13	13 000	0 0E+00	3 5E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-05	483 95	719 00	10 566	0 0E+00	2 0E-03
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 78E-03	418 31	636 00	8 501	0 0E+00	1 0E+00
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	409 34	617 20	10 566	0 0E+00	2 0E-03
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	418 31	636 00	8 501	0 0E+00	1 0E+00
105579 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	503 65	754 00	11 689	0 0E+00	1 4E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	447 21	684 75	9 271	0 0E+00	8 0E-01
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	503 65	754 00	11 689	0 0E+00	1 4E-02
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	1 61E+02	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	4 72E+02	1 52E-01	3 98E-07	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	455 02	684 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	6 66E-06	3 40E-01	4 18E-06	1 02E-07	582 55	825 00	13 121	0 0E+00	1 1E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	582 55	825 00	13 121	0 0E+00	1 1E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	615 18	873 00	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+02	1 30E-04	3 17E-06	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 80E-04	1 61E-05	655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	7 44E-07	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381 15	587 38	13 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosod-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509 60	748 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	613 96	848 76	13 000	2 6E-03	0 0E+00
7439978 Mercury (elemental)	8001352 Toxaphene	2 57E+05	1 16E-02	5 62E-02	4 67E-01	1 14E-02	629 88	1750 00	14 127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	657 15	873 31	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	8 00E-02	1 89E-01	4 60E-03	402 50	539 37	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	5 70E-02	8 20E-02	2 00E-03	377 50	512 27	19 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	340 50	475 22	18 000	1 0E-04	0 0E+00
				3 40E-01	2 13E-02	5 20E-04	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES

X

OR

YES

VERSION 1.2
September, 1998

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

ENTER Initial groundwater conc, C_w ($\mu\text{g/L}$)

158592 956133333

Chemical

cis-1,2-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Totals must add up to value of L_{wt} (cell D28)	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, k_v) (cm^2)
16	15	2346.96	1173.48	1173.48	0		B	S	C

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based groundwater concentration

1 of 7

7041344

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}$)	Reference conc., R/C (mg/m^3)
7.36E-02	1.13E-05	4.07E-03	26	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Source-building separation, L_r (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{we} (cm ³ /cm ³)														
Stratum A soil intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{rp} (cm ²)														
Stratum A 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, θ_a^{cz} (cm ³ /cm ³)														
Water-filled porosity in capillary zone, θ_w^{cz} (cm ³ /cm ³)														
Floor-wall seam perimeter, X_{crack} (cm)														
Bldg. ventilation rate, $Q_{building}$ (cm ³ /s)														
Area of enclosed space below grade, A_g (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)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)														
Stratum C effective diffusion coefficient, D^{eff}_C (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)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc, C_{source} (ug/m ³)														
Average vapor flow rate into bldg, Q_{soil} (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D^{crack} (cm ² /s)														
Exponent of equivalent foundation number, $\exp(Pe')$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc, $C_{building}$ (ug/m ³)														
Unit risk factor, URF (ug/m ³) ⁻¹														
Reference conc, RfC (mg/m ³)														
15	1.15E+02	0.10	5.70E-01	2.98E-03	3.84E+02	1.74E+03	4.60E-06	5.27E-04	NA	3.5E-02				

7041346

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc. (µg/L)	Indoor exposure groundwater conc. (µg/L)	Risk-based indoor exposure groundwater conc. (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc. (µg/L)
NA	6.93E+04	6.93E+04	3.50E+06	6.93E+04

ERROR SUMMARY BELOW:

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table									
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _s (cm ² /s)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)	
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092		
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016		
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020		
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040		
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044		
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025		
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029		
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046		
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039		
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0058		
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011		
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030		

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.48E-06	4.50E-02	6.49E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	2.19E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E+00	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	813 15	798 67	14,751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 80	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 81E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-08	1 85E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
95476 o-Xylene	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-08	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95578 2-Chlorophenol	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-07	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	447 53	675 00	9,572	0 0E+00	1 8E-02
100414 Ethylbenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100425 Styrene	3 63E+02	7 50E-02	1 69E+02	1 69E+02	3 23E-01	7 89E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25	418 31	636 00	11,329	0 0E+00	7 0E-02
106423 p-Xylene	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	8,737	0 0E+00	7 0E-02
106487 1,4-Dichlorobenzene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	411 52	616 20	8,525	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	345 65	519 13	7,800	0 0E+00	2 0E-01
174E+01	1 04E-01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	427 21	684 75	9,271	0 0E+00	8 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	404 87	632 40	8,410	0 0E+00	4 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	2 0E-02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 02E-07	25	674 15	842 94	14,000	0 0E+00	2 1E-02
117171 Bis(2-chloroethyl)ether	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 15	842 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	13,121	0 0E+00	1 1E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	14,447	4 6E-04	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	715 90	969 27	15,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 66E-06	1 50E-03	4 55E-03	1 11E-04	25	655 95	905 00	13,815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 66E-06	8 00E-04	3 40E-05	8 29E-07	25	714 15	979 00	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 46E-05	25	603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E-00	4 35E-04	1 08E-05	25	596 55	839 36	13,000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	3 7E-05	2 0E-02
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	558 00	770 00	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	509 60	746 87	13,000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 88E+03	9 23E-05	2 25E-06	25	613 96	848 76	11,000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	657 15	873 31	19,000	3 2E-04	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11068625 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
1107691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 09E-06	5 70E-02	8 20E-02	2 00E-03	25	340 50	475 22	18,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25					

DATA ENTRY SHEET

VERSION 12
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER	Chemical CAS No (numbers only, no dashes)	ENTER	Initial groundwater conc, C_w ($\mu\text{g/L}$)	Chemical 1,1-Dichloroethylene			
75354	21 87434783						
ENTER	Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER	Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER	Depth below grade to water table, L_{wt} (cm)	ENTER	Thickness of soil stratum A, h_a (cm)
16	15	2346 96	1173 48	1173 48	0	0	0
ENTER	Soil stratum A porosity, n^a (unitless)	ENTER	Soil stratum B porosity, n^b (unitless)	ENTER	Soil stratum C porosity, n^c (unitless)	ENTER	Soil stratum A porosity, n^a (unitless)
0.43	0.2	0.17	0.42	0.27	0.43	0.3	0.3
ENTER	Soil stratum A bulk density, ρ_b^a (g/cm^3)	ENTER	Soil stratum B bulk density, ρ_b^b (g/cm^3)	ENTER	Soil stratum C bulk density, ρ_b^c (g/cm^3)	ENTER	Soil stratum A bulk density, ρ_b^a (g/cm^3)
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS

ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS

ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS

ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS
ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum B soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum C soil type (used to estimate soil vapor permeability, k_v)	ENTER	Soil stratum A soil type (used to estimate soil vapor permeability, k_v)
SCS	SCS	SCS	SCS	SCS	SCS	SCS	SCS

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc. R/C (mg/m ³)
9.00E-02	1.04E-05	2.61E-02	25	6.247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Source-building separation, L_r (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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)
Bldg ventilation rate, Q_{ventg} (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	6.353	1.87E-02	7.88E-01	1.77E-04	3.65E-03	9.22E-04	0.00E+00	5.12E-04	1.45E-03	2331.96
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)		Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Pedet number, $\exp(Pe)$ (unitless)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Pedet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-y}^{-1}$)	Reference conc, RfC (mg/m^3)			
	15	7.88E+02	0.10	5.70E-01	3.65E-03	3.84E+02	4.48E+02	5.09E-06	4.07E-03	5.0E-05	NA			

7041352

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.21E+01	NA	1.21E+01	2.25E+06	1.21E+01

ERROR SUMMARY BELOW. -- (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No.	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vs} (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R _{IC} (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(e)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.09E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.81E-04	5.58E-03	25	390.88	563.05	10,346	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.58E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1,2-Trichloroethane	3.16E+01	7.42E-01	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethane	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E-04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	366.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03		25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	613 15	788 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+00	2 05E-04	5 00E-06	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+04	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 23E-06	8 00E+02	3 19E-04	7 78E-06	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	8 20E-06	1 78E+02	2 13E-01	1 20E-06	417 60	630 30	8,681	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 61E-02	7 03E-06	1 20E+03	1 78E-04	2 40E-06	528 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	4 30E-05	719 00	10,566	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	483 95	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	447 21	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 86E-02	2 43E-03	411 52	616 20	8,525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	356 65	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	455 02	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	582 55	825 00	14,447	4 8E-04	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	704 09	862 22	15,000	0 0E+00	7 0E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 87E-03	6 51E-05	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 08E-05	2 60E+03	3 21E-02	7 83E-04	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	1 60E-06	809 15	1078 24	17,000	2 1E-04	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 86E-05	1 60E-06	25 25	969 27	7,192	0 0E+00	3 5E-02
205992 Benzo(b)fluoranthene	1 23E+06	2 28E-02	5 58E-06	1 50E-03	4 55E-03	4 07E-03	333 65	544 00	7,192	0 0E+00	3 5E-02
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 11E-04	715 90	1078 24	17,000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 28E-02	5 58E-06	8 00E-04	3 40E-05	1 61E-05	655 95	905 00	13,815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	8 29E-07	753 15	1019 70	16,000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	603 01	839 37	13,000	4 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 06E-05	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	596 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381 15	587 38	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	3 06E-05	7 46E-07	558 00	770 00	11,000	2 0E-03	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	613 98	848 76	13,000	2 8E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	1 14E-02	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	6 00E-06	657 15	873 31	14,000	3 2E-04	0 0E+00
11098825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	4 60E-03	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 34E-06	8 00E-02	1 89E-01	2 00E-03	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 90E-04	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	5 20E-04	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

1,2-Dichloroethane

107062 21 96826087

ENTER Average soil groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v)	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346.96	1173.48	1173.48	0	0	B	S	C	

ENTER Stratum A soil dry bulk density, ρ_A (g/cm^3)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm^2)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER Averaging time for cardiogens, ATc (yrs)	ENTER Averaging time for noncardiogens, ATnc (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for cardiogens, TR (unitless)	ENTER Target hazard quotient for noncardiogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

1 of 7

7041356

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B ($^{\circ}\text{K}$)	Critical temperature, T_C ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RIC (mg/m^3)
1.04E-01	9.90E-06	9.78E-04	25	7.643	356.65	561.00	1.74E+01	8.52E+03	2.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{sa} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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, θ_{sa} (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_{wa} (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3 844
Bldg ventilation rate, $Q_{ventilating}$ (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8 457	6 27E-04	2 64E-02	1 77E-04	4 22E-03	1 09E-03	0 00E+00	6 27E-04	1 71E-03	2331 96
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	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 Parcel number, exp(Pe) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc, RfC (mg/m ³)			
15	2 64E+01	0 10	5 70E-01	4 22E-03	3 84E+02	1 95E+02	5 52E-06	1 46E-04	2 6E-05	NA			

7041358

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (ug/L)
6.42E+02	NA	6.42E+02	8.52E+06	6.42E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.046
SIC	0.02	0.005	1.09	0.083	0.28	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°C)	Critical temperature, T_c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., $R(C)$ (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E+03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-02	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
600E-01	Acetone	5.75E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	8.00E-06	5.00E+01	1.59E-01	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	7.40E-04	3.61E-04	8.80E-06	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	2.28E-01	5.66E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E+03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E+02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.84E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E+03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.08E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.70E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	363.15	596.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	5.61E-03	25	330.55	523.00	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	748.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E+03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.19E-01	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03		25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	25 613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25 660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25 632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25 570 44	870 00	12 668	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25 627 87	799 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	6 15E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	25 486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25 582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 18E-02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25 519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25 491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25 560 26	754 03	13 000	1 3E-04	0 0E+00
95476 p-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25 417 60	630 30	8 661	0 0E+00	7 0E-03
95487 2-Methylphenol (o-cresol)	8 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25 484 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25 453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25 447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25 526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25 483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25 409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25 418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25 484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 68E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26 411 52	618 20	8 525	0 0E+00	7 0E-00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	25 447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25 503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25 366 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25 345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25 412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 83E-03	25 383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 10E-06	4 72E+02	1 52E-01	3 71E-03	25 404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25 455 02	584 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25 451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25 674 15	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	25 657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	25 704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	3 24E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25 582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25 615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25 486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25 482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25 590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-01	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25 416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25 394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 03E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25 667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 38E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25 333 65	544 00	7 192	0 0E+00	3 5E-02
156805 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25 320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	1 60E-06	25 809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25 715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25 655 95	905 00	13 815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25 753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25 714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25 603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	3 35E-04	1 06E-05	25 596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25 596 55	839 36	13 000	5 3E-04	0 0E+00
542758 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25 381 15	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 46E-07	25 558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25 509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25 613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 82E-02	4 67E-01	1 14E-02	25 629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 48E-04	6 00E-06	25 687 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25 402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25 377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25 340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25 345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

Chemical

56235 22 1126087

Carbon tetrachloride

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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, k_v)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
15	0 43	0 2	17	0 42	0 27	17	0 43	0 3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, differential, ΔP (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0 1	0 45	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, ATc (yrs)	Averaging time for noncarcinogens, ATnc (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for carcinogens, TR (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041362

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	3.05E-02	25	7,127	349.90	556.60	1.74E+02	7.93E+02	1.5E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Source-building separation, L_T (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A soil effective permeability, k_e (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)
Bldg ventilation rate, Q_{ventg} (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.798	2.02E-02	8.53E-01	1.77E-04	3.16E-03	7.99E-04	0.00E+00	4.44E-04	1.26E-03	2331.96
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	8.53E+02		Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D_{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-}^{-1}$)	Reference conc., RfC (mg/m ³)			
	15		0.10	5.70E-01	3.16E-03	3.84E+02	1.15E+03	4.72E-06	4.03E-03	1.5E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
4.02E+01	NA	4.02E+01	7.93E+05	4.02E+01

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table					
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.0092
CL	0.26	0.019	1.31	0.237	0.068
L	1.04	0.036	1.56	0.359	0.096
LS	14.59	0.124	2.28	0.561	0.078
S	29.70	0.145	2.68	0.627	0.041
SC	0.12	0.027	1.23	0.187	0.045
SCL	1.31	0.059	1.48	0.324	0.100
SI	0.25	0.016	1.37	0.270	0.029
SIC	0.02	0.005	1.09	0.083	0.034
SICL	0.07	0.010	1.23	0.187	0.070
SIL	0.45	0.020	1.41	0.291	0.089
SL	4.42	0.075	1.89	0.471	0.067
					0.085

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H' (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RLC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	545.00	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	8.48E-04	1.58E-05	25	651.02	863.77	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	638.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.77E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromobenzene	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-06	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 28E-06	25	680 80	890 45	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,656	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	580 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	4 92E-05	1 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 78E-02	1 90E-03	25	453 57	705 00	10,800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	7 43E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 48E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	7 50E+02	7 50E-02	7 80E-06	1 69E+02	7 88E-03	2 78E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 08E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	411 52	684 75	9,271	0 0E+00	8 0E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 86E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 38E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	366 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 83E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 18E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E+01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	637 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 98E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E-00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,238	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	687 95	936 00	14,370	0 0E+00	1 1E-01
136592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 23E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
205992 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 58E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzofluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	3 5E-04	0 0E+00
319857 beta-HCH (beta-BHC)	6 92E+01	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	3 5E-04	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 28E-01	1 77E-02	25	381 15	770 00	12,938	1 9E-04	0 0E+00
606202 2,6-Dinitrotoluene	2 40E+01	5 45E-02	8 17E-06	9 88E+03	3 06E-05	7 46E-07	25	558 00	746 87	11,000	2 0E-03	0 0E+00
621647 N-Nitrosodipropylamine	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	637 15	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 00E-02	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

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

VERSION 1.2
September, 1998

YES ☒

OR

YES ☐

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

ENTER	ENTER
Chemical CAS No	Initial groundwater conc.
(numbers only, no dashes)	C _w (µg/L)

Chemical
Benzene

[illegible]

ENTER Stratum A soil dry bulk density,	ENTER Stratum A soil total porosity,	ENTER Stratum A soil water-filled porosity,	ENTER Stratum B soil dry bulk density,	ENTER Stratum B soil total porosity,	ENTER Stratum B soil water-filled porosity,	ENTER Stratum C soil dry bulk density,	ENTER Stratum C soil total porosity,	ENTER Stratum C soil water-filled porosity,
ρ_d^A	n^A	θ_w^A	ρ_d^B	n^B	θ_w^B	ρ_d^C	n^C	θ_w^C
(g/cm ³)	(unitless)	(cm ³ /cm ³)	(g/cm ³)	(unitless)	(cm ³ /cm ³)	(g/cm ³)	(unitless)	(cm ³ /cm ³)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER ENTER Soil-bldg pressure differential, ΔP (g/cm ²)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, W (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging	Averaging	Exposure	Exposure	Exposure	Target	Target
carcinogens,	time for	duration,	frequency,	EF	carcinogens,	carcinogens,
ATc	noncarcinogens,	ED	THQ	(days/yr)	TR	THQ
(yrs)	AT _{nc}	(yrs)	(unless)	(unless)	(unless)	(unless)
70	30	30	350	1	1	1

Used to calculate risk-based groundwater concentration

7041368

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
8.80E-02	9.80E-06	5.58E-03	25	7.342	353.24	562.16	5.89E+01	1.75E+03	8.3E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	2331.96	0.230	0.150	0.130	0.365	7.49E-10	0.797	5.97E-10	17.05	0.42	0.126	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B soil air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{se} (cm ³ /cm ³)														
Stratum A soil intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{rg} (cm ²)														
Stratum A 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_{seam} (cm)														
Bldg ventilation rate, Q_{ventg} (cm ³ /s)														
Area of enclosed space below grade, A_s (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} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)														
Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)														
Stratum C effective diffusion coefficient, D^{eff}_C (cm ² /s)														
Total overall effective diffusion coefficient, D^{eff}_T (cm ² /s)														
Diffusion path length, L_g (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} (mg/m ³)														
Crack radius, r_{crack} (cm)														
Average vapor flow rate into bldg, Q_{avg} (cm ³ /s)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Unit risk factor, URF (mg/m ³) ⁻¹														
Reference conc., R/C (mg/m ³)														
15	1.53E+02	0.10	5.70E-01	3.57E-03	3.84E+02	5.13E+02	5.04E-06	7.73E-04	8.3E-06	NA				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
3.79E+02	NA	3.79E+02	1.75E+06	3.79E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Sol Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0032
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
55235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-00	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E-06	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.89E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.68E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.80E-06	5.00E-01	1.59E-01	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71363	Buland	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	5.98E-03	25	353.24	563.05	9,510	4.0E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.98E-03	25	347.24	545.00	7,136	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.08E-01	1.72E-02	25	347.24	545.00	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	2.10E-05	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	5.0E-01
75343	1,1-Dichloroethane	3.18E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+05	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.92E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	380.36	542.00	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.38E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 28E-07	1 53E-08	627 87	898 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	486 15	739 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 80E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	8 30E-06	2 60E+04	2 13E-01	5 20E-03	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	526 15	719 13	13 000	0 0E+00	3 5E+01
99953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	483 95	759 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	411 52	616 20	8 525	0 0E+00	7 0E+00
108467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 98E-02	2 43E-03	447 21	684 75	9 271	0 0E+00	8 0E+01
108478 p-Chloroaniline	6 81E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	503 65	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 82E+03	4 01E-02	9 78E-04	358 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7 930	0 0E+00	4 0E+01
109807 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	4 72E+02	1 52E-01	3 98E-07	404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	8 70E-06	8 26E+04	1 63E-05	3 98E-07	451 15	659 79	9 000	3 3E-04	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	674 43	942 94	14 000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+02	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	582 55	825 00	14 447	4 6E-04	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	675 15	806 00	15 989	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	667 95	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	333 65	544 00	7 192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 38E-03	320 85	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 86E-06	2 20E+05	6 86E-06	1 60E-06	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 61E-05	753 15	1019 70	16 000	2 1E-05	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	8 29E-07	714 15	979 00	16 455	2 1E-06	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	9 46E-05	603 01	839 37	13 000	4 9E-03	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	1 70E-04	503 01	839 30	13 000	1 8E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	7 44E-07	596 55	839 36	13 000	5 3E-04	0 0E+00
319848 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	6 26E-02	1 00E-05	2 40E+01	3 05E-05	7 44E-07	381 15	587 38	7 000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	848 76	14 127	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	629 88	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	657 15	873 31	14 000	3 2E-04	0 0E+00
11098825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER Initial groundwater conc. C_w (ug/L)
67683 6 357051282

Chemical

Chloroform

ENTER Average soil/groundwater temperature, T_s (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (cm)	ENTER Thickness of soil stratum C, h_C (cm)	ENTER Totals must add up to value of L_{wt} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v) (cm ²)
16	15	1524	670.56	60.98	792.48		C	S	SI

ENTER Stratum A bulk density, ρ_A (g/cm ³)	ENTER Stratum A soil porosity, n_A (unitless)	ENTER Stratum A soil dry bulk density, ρ_{dA} (g/cm ³)	ENTER Stratum B soil porosity, n_B (unitless)	ENTER Stratum B soil dry bulk density, ρ_{dB} (g/cm ³)	ENTER Stratum B soil water-filled porosity, θ_{wB} (cm ³ /cm ³)	ENTER Stratum C soil porosity, n_C (unitless)	ENTER Stratum C soil dry bulk density, ρ_{dC} (g/cm ³)	ENTER Stratum C soil water-filled porosity, θ_{wC} (cm ³ /cm ³)
1.5	0.43	0.2	0.42	0.27	0.43	0.3		

ENTER Enclosed space floor thickness, L_{enc} (cm)	ENTER Enclosed space floor length, L_g (cm)	ENTER Enclosed space floor width, W_g (cm)	ENTER Enclosed space height, H_g (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_r (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fe} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A 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 permeability, X_{crack} (cm)
Bldg. ventilation rate, $Q_{venting}$ (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	6.40E-04	7.36E-04	1.04E-03	1509
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)			Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m ³)				
	15	1.04E+02	0.10	6.67E-01	4.22E-03	3.84E+02	4.80E+02	5.79E-06	6.03E-04	2.3E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.75E+02	NA	1.75E+02	7.92E+06	1.75E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ² /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_a (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_b (cal/mol)	Unit risk factor, URF (μ g/m ³) ¹	Reference conc., RIC (mg/m ³)
50293	DOT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	4.74E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
67041	Axalone	6.00E-01	5.35E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	761.00	10,000	0.0E+00	1.4E+01
67663	Chloroform	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67721	Hexachloroethane	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
71363	Butanol	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71432	Benzene	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.85E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
72208	Endrin	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72435	Methoxychlor	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72548	DDD	9.77E+04	1.56E-02	4.48E-06	4.50E-02	8.48E-04	4.00E-06	25	639.90	863.77	14,000	0.0E+00	1.8E-02
72559	DDE	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	14,000	6.9E-05	0.0E+00
74838	Methyl bromide	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-05	25	276.71	487.00	13,000	9.7E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-05	25	259.25	432.00	5,714	0.0E+00	5.0E-03
75092	Methylene chloride	1.86E+01	1.08E-01	1.23E-05	2.76E+03	1.11E+00	2.71E-02	25	313.00	510.00	5,250	8.4E-05	0.0E+00
75150	Carbon disulfide	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	302.02	552.00	6,706	4.7E-07	3.0E+00
75252	Bromoform	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	422.35	686.00	9,479	1.1E-06	0.0E+00
75343	1,1-Dichloroethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75354	1,1,2-Dichloroethane	3.16E+01	7.42E-02	1.03E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
76448	Heptachlor	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	578.05	6,247	0.0E+00	5.0E-01
77474	Hexachlorocyclopentadiene	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
78591	Isophorone	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78875	1,2-Dichloropropane	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
79005	1,1,2-Trichloroethane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79016	Trichloroethylene	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
83329	Acenaphthene	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
		7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-08	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	660 60	890 68	13,000	0 0E+00	7 0E-01
86308 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	6 33E-02	7 83E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14,000	3 4E-05	0 0E+00
88082 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 23E-06	8 00E+02	3 19E-04	7 78E-06	519 15	749 40	12,000	3 1E-06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 83E-04	491 14	748 40	10,373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	4 00E-09	560 26	754 03	13,000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	5 20E-03	417 60	630 30	8,661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 20E-06	464 19	697 60	10,800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	447 53	675 00	9,572	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	526 15	759 13	13,000	0 0E+00	1 8E-02
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	8 00E-06	3 10E+02	8 20E-05	7 88E-03	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 09E-06	3 10E+02	1 13E-01	2 76E-03	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	356 65	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	8,523	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	7,900	0 0E+00	7 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	4 72E+02	1 52E-01	3 71E-03	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	8 70E-06	8 28E+04	1 63E-05	3 98E-07	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 58E-06	5 10E-01	4 59E-04	1 12E-05	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 68E-06	3 40E-01	4 18E-06	1 02E-07	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	815 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	6 30E+03	3 85E-01	9 39E-03	809 15	516 50	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	2 20E-05	6 56E-05	1 60E-06	25 333 65	544 00	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 56E-05	1 60E-06	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	763 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 86E-03	9 46E-05	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	581 15	839 36	13,000	5 3E-04	0 0E+00
542758 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	613 96	848 76	13,000	2 6E-03	0 0E+00
8001352 Toxaphene	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	629 88	1750 00	14,127	0 0E+00	3 0E-04
11098825 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	657 15	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	377 50	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	4 20E-01	2 13E-02	2 90E-04	345 50	475 22	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc,
 C_w
($\mu\text{g/L}$)

Chemical

79016 82 77423077

Trichloroethylene

ENTER Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	ENTER Depth below grade to bottom of enclosed space floor, L_f (cm)	ENTER Depth below grade to water table, L_{wt} (cm)	ENTER Thickness of soil stratum A, (Enter value or 0) h_a (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_b (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_c (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C) C	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) SI	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48			

ENTER Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_{wf}^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_{wf}^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_{wf}^C (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3

ENTER Enclosed space floor thickness, L_{encl} (cm)	ENTER Soil-bldg pressure differential, ΔP ($\text{g/cm} \cdot \text{s}^2$)	ENTER Enclosed space floor length, L_b (cm)	ENTER Enclosed space floor width, W_b (cm)	ENTER Enclosed space height, H_b (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based
groundwater concentration

7041380

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7.505	380.36	544.20	1.66E+02	1.10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{ef} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rg} (cm^2)	Stratum A soil effective permeability, k_e (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 permeator, X_{crack} (cm)
Bldg ventilation rate, $Q_{venting}$ (cm^3/s)		Area of enclosed space below grade, A_g (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	8.483	6.60E-03	2.78E-01	1.77E-04	3.20E-03	8.11E-04	4.82E-04	5.55E-04	7.86E-04	1509
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)			Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{vldg} (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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R/C (mg/m ³)			
	15	2.78E+02	0.10	6.67E-01	3.20E-03	3.84E+02	3.39E+03	4.98E-06	1.38E-03	1.7E-06	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (ug/L)	Indoor exposure groundwater conc , noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc , (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc , (ug/L)
1.04E+03	NA	1.04E+03	1.10E+06	1.04E+03

INCREMENTAL RISK CALCULATIONS

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

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

VLOOKUP TABLES

SCS Soil Type		Soil Properties Lookup Table					Mean Grain Diameter (cm)	
	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D_a (cm ² /s)	D_w (cm ² /s)	θ_s (cm ³ /cm ³)	θ_l (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.38	0.092	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030	0.065	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.86E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.78E-06	9.00E-02	1.84E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	8.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	8,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E+00	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	681.15	8,996	5.8E-05	0.0E+00
83329	Acanaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 D-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 38E-10	25 513 15	798 67	14,751	0 0E+00	3 8E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 20E-06	25 660 60	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25 632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25 570 44	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25 627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 37E+00	3 34E-01	8 15E-03	25 486 15	738 00	10,205	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25 582 15	813 20	14,000	3 4E+05	0 0E+00
88002 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25 519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25 491 14	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25 560 26	754 03	13,000	1 3E-04	0 0E+00
95478 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	1 78E-02	2 13E-01	25 417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25 464 19	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25 453 57	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25 447 53	675 00	9,572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25 526 15	719 13	13,000	0 0E+00	3 9E+01
98953 Nitrobenzene	8 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25 483 95	759 00	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E+02	3 23E-01	7 88E-03	2 76E-03	25 409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	2 09E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 00E-06	25 418 31	636 00	11,329	0 0E+00	7 0E+02
105879 2,4-Dimethylphenol	5 84E-02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	7 68E-03	26 411 52	616 20	8,525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	2 43E-03	25 447 21	664 75	9,271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	3 32E-07	25 503 65	754 00	11,689	0 0E+00	1 4E+02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	8 78E-04	25 355 65	561 00	7,643	2 6E+05	0 0E+00
107082 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	5 12E-04	25 345 65	519 13	7,800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+02	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25 412 27	617 05	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25 383 78	591 79	7,930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25 404 87	632 40	8,410	0 0E+00	2 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 98E-07	25 455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 80E-05	25 451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 02E-05	25 674 43	942 94	14,000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+03	1 15E-02	4 56E-06	5 10E-01	4 59E-04	1 12E-05	25 657 15	806 00	15,999	4 0E+06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25 582 55	825 00	14,447	4 6E-04	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25 704 09	862 22	15,000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25 582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25 615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25 486 15	725 00	10,471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25 582 55	825 00	14,447	4 6E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25 590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25 416 14	678 20	8,000	2 4E+05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25 394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25 667 95	936 00	14,370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25 333 65	544 00	7,192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 38E-03	25 320 85	516 50	6,717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25 809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25 715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25 655 95	905 00	13,815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25 753 15	1019 70	16,000	2 1E+05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 48E-05	25 714 15	979 00	16,455	2 1E+06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 88E-06	1 80E-01	6 97E-03	1 70E-04	25 603 01	839 00	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25 596 55	839 36	13,000	1 8E+03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25 598 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25 381 15	587 38	7,000	3 7E+05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 48E-07	25 558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	1 32E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25 509 60	746 87	11,000	2 0E+03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25 613 96	848 76	13,000	2 6E+03	0 0E+00
743978 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25 629 88	1750 00	14,127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25 657 15	873 31	19,000	1 0E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25 402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25 377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25 340 50	475 22	18,000	1 0E-04	0 0E+00
53469218 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25 345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☐ X ☐

OR

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

YES ☐

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Chemical CAS No (numbers only, no dashes)	Initial groundwater conc, C_w ($\mu\text{g/L}$)	Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
79005	3 578461538														
Chemical 1,1,2-Trichloroethane															
ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)		Depth below grade to bottom of enclosed space floor, L_f (cm)		Depth below grade to water table, L_{wt} (cm)		Thickness of soil stratum A, h_A (cm)		Thickness of soil stratum B, h_B (cm)		Thickness of soil stratum C, h_C (cm)		Soil stratum directly above water table, (Enter A, B, or C)		Soil stratum A SCS soil type (used to estimate soil vapor permeability, k_v , cm^2)	
16	15	1524	670 56	60 96	792 48	C	S	S	S	S	S	S	S	S	S

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil total porosity, n^C (unitless)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	0.43	0.3	0.43	0.3	0.43	0.3	0.43

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	Enclosed space floor length, L_g (cm)	Enclosed space floor width, W_g (cm)	Enclosed space height, H_g (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45

ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER		ENTER	
Averaging time for carcinogens, AT_c (yrs)	Averaging time for noncarcinogens, AT_{nc} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Target risk for carcinogens, TR (unitless)	Target risk for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)	Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1	1	1	1	1	1	1	1	1	1	1

Used to calculate risk-based groundwater concentration

7041386

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8.322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	0.230	0.150	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	0.130	0.419	Stratum A effective total fluid saturation, S_{la} (cm^3/cm^3)	0.746	9.36E-10	Stratum A soil relative permeability, k_{ra} (cm^2)	6.98E-10	Stratum A effective vapor permeability, k_v (cm^2)	17.05	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	0.136	0.294	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	3.844	Floor-wall seam perimeter, X_{seam} (cm)
Bldg. ventilation rate, Q_{venting} (cm^3/s)		Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)							
Convection path length, L_p (cm)	Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, $\exp(\text{Pe})$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., R(C) (mg/m ³)												
15	2.33E+01	0.10	6.67E-01	3.17E-03	3.68E+03	5.10E-06	1.19E-04	1.6E-05	NA												

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.28E+03	NA	1.28E+03	4.42E+06	1.28E+03

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	D _a (cm ² /s)	D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _C (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.068	0.0092						
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.095	0.016						
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.078	0.020						
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.057	0.040						
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	0.045	0.044						
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.100	0.025						
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.100	0.029						
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.046	0.034	0.046						
SIC	0.07	0.005	1.09	0.083	0.26	0.070	0.0039	0.070	0.0039						
SICL	0.02	0.010	1.23	0.187	0.43	0.089	0.0056	0.089	0.0056						
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.067	0.011						
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.065	0.030						

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R _C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65650	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+03	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-05	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71558	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72453	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.89E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-02	25	313.00	510.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	2.19E-02	3.02E-02	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.88E-02	1.08E-05	6.74E+03	6.56E-02	1.60E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	6.16E-03	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-06	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	5.01E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.80E-06	2.97E+03	1.41E-02	3.44E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	513 15	798 67	14,751	0 0E+00	3 8E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 89E+00	5 17E-05	1 28E-06	25	660 60	839 68	13,000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	898 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	1 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	8 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-08	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E+02
95594 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 70E-03	25	418 31	636 00	11,329	0 0E+00	7 0E+02
105879 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	8,525	0 0E+00	7 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25	447 21	684 75	9,271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 86E-02	2 43E-03	25	503 65	754 00	11,689	0 0E+00	1 4E+02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	345 65	519 13	7,843	2 6E-05	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	412 27	617 05	7,800	0 0E+00	2 0E+01
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	519 13	852 3	8,523	0 0E+00	7 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E+01	7 34E-03	25	404 87	591 79	7,930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	632 40	8,410	0 0E+00	2 0E+02
108907 Chlorobenzene	2 19E+02	7 30E-02	9 10E-06	8 28E+04	1 52E-01	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
108952 Phenol	2 88E+01	8 20E-02	8 70E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 01E+01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E+02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 02E-07	25	704 09	806 00	15,999	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 88E-06	2 00E-02	2 74E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 10E-05	25	394 40	620 20	8,288	5 8E-07	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 10E-05	25	333 65	544 00	14,370	0 0E+00	1 1E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	320 85	516 50	7,192	0 0E+00	3 5E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	7,192	0 0E+00	3 5E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 86E-06	2 20E+05	6 58E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E+03	4 56E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	685 95	905 00	13,815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E+04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E+03	3 88E-03	9 48E-05	25	714 15	979 00	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E+01	6 97E-03	1 70E-04	25	603 01	839 37	16,455	2 1E-06	0 0E+00
319848 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	1 8E-03	0 0E+00
542756 1,3-Dichloropropane	4 57E+01	8 26E-02	1 00E-05	2 60E+03	7 28E-01	1 77E-02	25	381 15	539 56	7,000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 08E-05	7 48E-07	25	568 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
1024573 Heptachlor epoxide	4 57E+01	3 07E-02	6 30E-06	5 82E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E+01	2 46E-04	6 00E-06	25	657 15	873 31	19,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER

Initial

Chemical

CAS No.

(numbers only,
no dashes) C_w

(μg/L)

127184 29 37435697

ENTER

Depth

below grade

of enclosed

space floor,

 L_f

(cm)

15

ENTER

Depth

below grade

to water table,

 L_{wt}

(cm)

1524

ENTER

Totals must add up to value of L_{vt} (cell D28)

Thickness

of soil

stratum A,

 h_A

(cm)

670.56

ENTER

Thickness

of soil

stratum B,

 h_B

(cm)

60.96

ENTER

Thickness

of soil

stratum C,

 h_C

(cm)

792.48

ENTER

Soil

stratum directly above

water table,

(Enter A, B, or C)

C

ENTER

Soil

stratum A

SCS

soil type

(used to estimate

soil vapor

permeability,

 k_v (cm²)

ENTER

Tetrachloroethylene

1.5

0.43

0.2

1.7

0.42

0.27

1.7

0.43

0.3

ENTER

Stratum A

soil dry

bulk density,

 ρ_s^A (g/cm³)

1.5

ENTER

Stratum A

soil total

porosity,

 n^A

(unitless)

0.43

ENTER

Stratum A

soil water-filled

porosity,

 θ_w^A (cm³/cm³)

0.2

ENTER

Enclosed

space

floor

length,

 L_E

(cm)

961

ENTER

Enclosed

space

floor

width,

 W_E

(cm)

961

ENTER

Enclosed

space

height,

 H_E

(cm)

488

ENTER

Enclosed

space

seam crack

width,

 W

(cm)

0.1

ENTER

Indoor

air exchange

rate,

ER

(1/h)

0.45

ENTER

Stratum A

soil dry

bulk density,

 ρ_s^A (g/cm³)

1.5

ENTER

Stratum B

soil dry

porosity,

 n^B

(unitless)

0.42

ENTER

Stratum B

soil water-filled

porosity,

 θ_w^B (cm³/cm³)

0.27

ENTER

Stratum C

soil total

porosity,

 n^C

(unitless)

0.43

ENTER

Stratum C

soil water-filled

porosity,

 θ_w^C (cm³/cm³)

0.3

ENTER

User-defined

stratum A

soil vapor

permeability,

 k_v (cm²)

ENTER

Used to calculate risk-based

groundwater concentration

1 of 7

7041392

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{ow} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8.288	394.40	620.20	1.55E+02	2.00E+02	5.8E-07	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)														
Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)														
Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)														
Stratum A effective total fluid saturation, S_{eA} (cm^3/cm^3)														
Stratum A soil intrinsic permeability, k_i (cm^2)														
Stratum A relative air permeability, k_{pA} (cm^2)														
Stratum A effective vapor permeability, k_v (cm^2)														
Thickness of capillary zone, L_{cA} (cm)														
Total porosity in capillary zone, n_{cA} (cm^3/cm^3)														
Air-filled porosity in capillary zone, θ_{aA} (cm^3/cm^3)														
Water-filled porosity in capillary zone, θ_{wA} (cm^3/cm^3)														
Floor-wall seam perimeter, X_{crack} (cm)														
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)														
Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)														
Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)														
Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)														
Total effective diffusion coefficient, $D_{eff,T}$ (cm^2/s)														
Diffusion path length, L_q (cm)														
Convection path length, L_p (cm)														
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)														
Average vapor flow rate into bldg., Q_{soil} (cm^3/s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm^2/s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite indoor attenuation coefficient, α (unitless)														
Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)														
Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹														
Reference conc., RfC (mg/m ³)														
15	4.71E+02	0.10	6.67E-01	2.92E-03	3.84E+02	7.48E+03	4.69E-06	2.21E-03	5.8E-07	NA				

7041394

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
1.90E+03	NA	1.90E+03	2.00E+05	1.90E+03

INCREMENTAL RISK CALCULATIONS

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

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Sol Properties Lookup Table						
SCS Sol Type	K _s (cm ² /h)	α (1/cm)	N (unitless)	M (unitless)	D _s (cm ² /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K _{oc}	Diffusivity In air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ¹ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°K)	Critical temperature, T _c (°K)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,b} (cal/mol)	Unit risk factor, URF (μg/m ³) ¹	References conc., RHC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	8.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.56E-03	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	1.72E-02	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.58E-05	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	4.57E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75252	Bromoforn	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	389.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acanaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84652 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E+02	7 86E+06	1 12E+01	3 85E+08	9 39E-10	14 751	0 0E+00	3 9E+01
85687 Butyl benzyl phthalate	5 75E+04	3 14E+02	4 83E+06	2 89E+00	5 17E+05	1 28E+06	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E+02	6 35E+06	3 51E+01	2 05E+04	5 00E-06	839 68	0 0E+00	0 0E+00
86737 Fluorene	1 38E+04	3 63E+02	7 88E+06	1 98E+00	2 61E+03	6 37E+05	890 45	1 4E+06	0 0E+00
86748 Carbazole	3 39E+03	3 90E+02	7 03E+06	7 48E+00	6 26E+07	8 15E-08	870 00	0 0E+00	1 4E+01
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E+02	6 16E+06	3 23E+00	3 34E+01	1 53E+08	13 977	5 7E+06	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 80E+02	6 10E+06	1 95E+03	1 00E+06	2 44E+08	10 206	2 2E+05	0 0E+00
89082 2,4,6-Trichlorophenol	3 81E+02	3 18E+02	6 25E+06	8 00E+02	3 19E+04	7 78E+06	14 000	3 4E+05	0 0E+00
91203 Naphthalene	2 00E+03	5 90E+02	7 50E+06	3 10E+01	1 98E+02	4 83E+04	12 000	3 1E+06	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 84E+02	6 74E+06	3 11E+00	1 64E+07	7 48 00	10 373	0 0E+00	1 4E+01
95476 o-Xylene	3 63E+02	8 70E+02	1 00E+05	1 78E+02	2 13E+01	4 00E+09	13 000	1 3E+04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E+02	7 90E+06	1 96E+02	4 92E+05	5 20E+03	6 601	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	2 80E+04	4 92E+05	1 20E+06	10 800	0 0E+00	1 8E+01
95578 2-Chlorophenol	3 88E+02	5 01E+02	9 46E+06	2 20E+04	1 60E+02	3 90E+04	9 700	0 0E+00	2 0E+01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E+02	7 03E+06	1 20E+03	1 78E+04	4 34E+06	9 572	0 0E+00	1 8E+02
98953 Nitrobenzene	6 46E+01	7 60E+02	8 60E+06	2 09E+03	9 84E+04	2 40E+05	13 000	0 0E+00	3 9E+01
100414 Ethylbenzene	3 63E+02	7 50E+02	7 80E+06	1 69E+02	3 23E+01	7 88E+03	10 566	0 0E+00	2 0E+03
100425 Styrene	7 76E+02	7 10E+02	8 00E+06	3 10E+02	1 13E+01	2 78E+03	8 501	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E+02	8 69E+06	7 87E+03	8 20E+05	2 00E+06	11 329	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E+02	8 44E+06	1 85E+02	3 14E+01	7 68E+03	8 525	0 0E+00	7 0E+00
106487 1,4-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	7 38E+01	9 96E+02	2 43E+03	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E+02	1 01E+05	5 30E+03	1 36E+05	3 32E+07	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E+01	9 90E+06	8 52E+03	4 01E+02	9 78E+04	7 843	2 6E+05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E+02	9 20E+06	2 00E+04	2 10E+02	5 12E+04	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E+02	7 80E+06	1 81E+02	3 01E+01	7 34E+03	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E+02	8 80E+06	5 26E+02	2 72E+01	6 63E+03	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E+02	8 10E+06	8 28E+04	1 52E+01	3 71E+03	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E+02	9 10E+06	4 72E+02	1 63E+05	3 98E+07	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E+02	7 53E+06	1 72E+04	7 38E+04	1 80E+05	9 000	3 3E+04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E+02	4 55E+06	5 10E+01	4 59E+04	1 12E+05	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E+02	3 66E+06	3 40E+01	4 18E+06	1 02E+07	8 06 00	4 0E+06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E+02	3 58E+06	2 00E+02	2 74E+03	6 68E+05	15 999	0 0E+00	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E+02	5 91E+06	6 20E+00	5 41E+02	1 32E+03	14 447	4 6E+04	0 0E+00
120127 Anthracene	2 95E+04	3 24E+02	7 74E+06	4 34E+02	2 67E+03	6 51E+05	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E+02	8 23E+06	3 00E+02	5 82E+02	3 17E+06	11 000	0 0E+00	1 1E+02
120832 2,4-Dichlorophenol	1 47E+02	3 46E+02	8 77E+06	4 50E+03	1 30E+04	9 27E+08	13 467	1 9E+04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E+01	7 06E+06	2 70E+02	3 80E+06	3 17E+06	8 000	2 4E+05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E+02	1 05E+05	2 80E+03	3 21E+02	7 83E+04	8 288	5 8E+07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E+02	8 20E+06	2 00E+02	7 54E+01	1 84E+02	14 370	0 0E+00	3 5E+02
129000 Pyrene	1 05E+05	2 72E+02	7 24E+06	1 35E+01	4 51E+04	1 10E+05	7 192	0 0E+00	3 5E+02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E+02	1 13E+05	3 50E+03	1 67E+01	4 07E+03	6 717	0 0E+00	7 0E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E+02	1 19E+05	6 30E+03	3 85E+01	9 39E+03	17 000	2 1E+04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E+02	5 66E+06	2 20E+05	6 56E+05	1 60E+06	15 000	2 1E+04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E+02	5 56E+06	1 50E+03	4 55E+03	1 11E+04	16 000	2 1E+05	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E+02	6 35E+06	2 08E+01	6 60E+04	1 61E+05	16 455	2 1E+06	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E+02	5 56E+06	8 00E+04	3 40E+05	8 29E+07	905 00	0 0E+00	1 4E+01
218019 Chrysene	3 98E+05	2 48E+02	6 21E+06	1 60E+03	3 88E+03	9 48E+05	10 190	0 0E+00	0 0E+00
309002 Aldrin	2 45E+06	1 32E+02	4 86E+06	1 80E+01	6 97E+03	1 70E+04	839 37	0 0E+00	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E+02	7 34E+06	2 00E+00	4 35E+04	1 08E+05	13 000	1 8E+03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E+02	7 34E+06	2 40E+01	3 05E+05	7 44E+07	839 36	0 0E+00	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E+02	1 00E+05	2 80E+03	7 26E+01	1 77E+02	587 38	3 5E+04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E+02	7 26E+06	1 82E+02	3 06E+05	7 46E+07	12 938	1 9E+04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E+02	8 17E+06	9 89E+03	9 23E+05	2 25E+06	746 87	0 0E+00	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E+02	4 23E+06	2 00E+01	3 90E+04	9 51E+06	13 000	2 6E+03	0 0E+00
743976 Mercury (elemental)	5 20E+01	3 07E+02	6 30E+06	5 62E+02	4 67E+01	1 14E+02	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E+02	4 34E+06	7 40E+01	2 46E+04	6 00E+06	873 31	3 2E+04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E+02	4 32E+06	8 00E+02	1 89E+01	4 60E+03	19 000	1 0E+04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E+02	5 00E+06	5 70E+02	8 20E+02	2 00E+03	19 000	1 0E+04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E+02	5 42E+06	4 20E+01	1 19E+02	2 90E+04	18 000	1 0E+04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E+02	5 31E+06	3 40E+01	2 13E+02	5 20E+04	18 000	1 0E+04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Chemical CAS No	Initial groundwater conc.	Depth below grade to bottom of enclosed space floor.	Depth below grade to water table, L_{wt}	Thickness of soil stratum A, h_a	Thickness of soil stratum B, h_b	Thickness of soil stratum C, h_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)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)	Soil stratum A SCS soil type (used to estimate soil vapor permeability)
79345	12 19084103	15	1524	670.56	60.96	792.48	C	S	SI				
1,1,2,2-Tetrachloroethane													

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A	Stratum A soil total porosity, $\theta_{w,A}$	Stratum A soil water-filled porosity, $\theta_{w,A}^A$	Stratum B soil dry bulk density, ρ_s^B	Stratum B soil total porosity, $\theta_{w,B}$	Stratum B soil water-filled porosity, $\theta_{w,B}^B$	Stratum C soil dry bulk density, ρ_s^C	Stratum C soil total porosity, $\theta_{w,C}$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$	Stratum C soil water-filled porosity, $\theta_{w,C}^C$
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	0.3	0.3	0.3	0.3	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc}	Enclosed space floor length, L_g	Enclosed space floor width, W_g	Enclosed space height, H_g	Enclosed space height, H_g	Enclosed space width, W	Enclosed space width, W	Enclosed space height, H_g	Enclosed space height, H_g	Enclosed space width, W	Enclosed space width, W	Enclosed space height, H_g	Enclosed space height, H_g	Enclosed space width, W
15	40	961	961	488	0.1	0.45	0.1	0.45	0.1	0.45	0.1	0.45	0.45

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT _c	Averaging time for noncarcinogens, AT _{nc}	Exposure duration, ED	Exposure frequency, EF	Target risk for carcinogens, TR	Target risk for noncarcinogens, THQ	Target risk for carcinogens, TR	Target risk for noncarcinogens, THQ	Target risk for carcinogens, TR	Target risk for noncarcinogens, THQ	Target risk for carcinogens, TR	Target risk for noncarcinogens, THQ	Target risk for carcinogens, TR	Target risk for noncarcinogens, THQ
70	30	30	350	1.0E-06	1	1.0E-06	1	1.0E-06	1	1.0E-06	1	1.0E-06	1

Used to calculate risk-based
groundwater concentration

7041398

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^\circ\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^\circ\text{K}$)	Critical temperature, T_c ($^\circ\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RfC (mg/m^3)
7 10E-02	7 90E-06	3.44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A air-filled porosity, θ_a (cm ³ /cm ³)	Stratum B air-filled porosity, θ_b (cm ³ /cm ³)	Stratum C air-filled porosity, θ_c (cm ³ /cm ³)	Stratum A effective total fluid saturation, S_{fe} (cm ³ /cm ³)	Stratum A soil intrinsic permeability, k_s (cm ²)	Stratum A soil relative air permeability, k_{ra} (cm ²)	Stratum A 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)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3 844
Bldg ventilation rate, Q_{vent} (cm ³ /s)	Area of enclosed space below grade, A_g (cm ²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} (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)	Stratum A effective diffusion coefficient, $D_{eff,A}$ (cm ² /s)	Stratum B effective diffusion coefficient, $D_{eff,B}$ (cm ² /s)	Stratum C effective diffusion coefficient, $D_{eff,C}$ (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)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10 480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	5 83E-04	8 32E-04	1509
Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m ³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{avg} (cm ³ /s)	Crack effective diffusion coefficient, D_{crack} (cm ² /s)	Area of crack, A_{crack} (cm ²)	Exponent of equivalent foundation Pedet number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., C_{bldg} (µg/m ³)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R(C) (mg/m ³)			
15	8 36E+00	0 10	6 67E-01	2 90E-03	3 84E+02	7 88E+03	5 12E-06	4 28E-05	5 8E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
9.79E+02	NA	9.79E+02	2.97E+06	9.79E+02

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)
C	0.20	0.008	1.09	0.083	0.38	0.068
CL	0.26	0.019	1.31	0.237	0.41	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078
LS	14.59	0.124	2.28	0.561	0.41	0.040
S	29.70	0.145	2.68	0.627	0.43	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.065

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-cm ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RLC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.08E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.98E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.09E-01	7.51E-06	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	1.59E-05	25	651.02	863.77	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.61E-05	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	489.35	715.00	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	2.80E-06	25	369.52	572.00	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	602.00	8,322	1.6E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03		25					

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E+02	6 35E+06	1 08E+03	1 85E+05	4 51E-07	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E+02	7 86E+06	1 12E+01	3 85E+08	9 39E-10	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E+02	4 83E+06	2 69E+00	5 17E+05	1 28E+06	1 28E+06	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E+02	6 35E+06	3 51E+01	2 05E+04	5 00E+06	13 000	1 4E+06	0 0E+00
86737 Fluorene	1 38E+04	3 63E+02	7 88E+06	1 98E+00	2 61E+03	6 37E+05	12 866	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E+02	7 03E+06	7 48E+00	6 26E+07	1 53E+08	13 977	5 7E+06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	6 16E+02	6 16E+06	3 34E+01	3 34E+01	8 15E+03	10 206	2 2E+05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E+02	6 10E+06	1 95E+03	1 00E+06	2 44E+08	14 000	3 4E+05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E+02	6 25E+06	8 00E+02	3 19E+04	7 78E+06	12 000	3 1E+06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E+02	7 50E+06	3 10E+01	1 98E+02	4 83E+04	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E+02	6 74E+06	3 11E+00	1 64E+07	4 00E+09	754 03	1 3E+04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E+02	1 00E+05	1 78E+02	2 13E+01	5 20E+03	630 30	8 661	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E+02	8 30E+06	2 60E+04	4 92E+05	2 00E+06	597 60	10 800	0 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E+02	7 90E+06	1 56E+02	7 79E+02	1 90E+03	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E+02	9 46E+06	2 20E+04	1 60E+02	3 90E+04	6 750	0 0E+00	1 8E+02
95864 2,4,5-Trichlorophenol	1 60E+03	2 91E+02	7 03E+06	1 20E+03	1 78E+04	4 34E+06	759 13	13 000	0 0E+00
98953 Nitrobenzene	6 46E+01	7 60E+02	8 60E+06	2 09E+03	9 84E+04	2 40E+05	719 00	10 566	0 0E+00
100414 Ethylbenzene	3 63E+02	7 50E+02	7 80E+06	1 69E+02	3 23E+01	7 88E+03	617 20	8 501	0 0E+00
100425 Styrene	7 76E+02	7 10E+02	8 00E+06	3 10E+02	1 13E+01	2 78E+03	636 00	8 737	0 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E+02	8 69E+06	7 87E+03	8 20E+05	2 00E+06	707 60	11 329	0 0E+00
106423 p-Xylene	3 89E+02	7 69E+02	8 44E+06	1 85E+02	3 14E+01	7 68E+03	616 20	8 525	0 0E+00
106487 p-Chlorobenzene	6 17E+02	6 90E+02	7 90E+06	7 38E+01	9 96E+02	2 43E+03	684 75	9 271	0 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E+02	1 01E+05	5 30E+03	1 36E+05	3 32E+07	754 00	11 689	0 0E+00
107062 1,2-Dichloroethane	1 74E+01	1 04E+01	9 90E+06	8 52E+03	4 01E+02	9 78E+04	561 00	7 643	2 6E+05
108054 Vinyl acetate	5 25E+00	8 50E+02	9 20E+06	2 00E+04	2 10E+02	7 80E+04	519 13	7 800	0 0E+00
108383 m-Xylene	4 07E+02	7 00E+02	7 80E+06	1 61E+02	3 01E+01	7 34E+03	617 05	8 523	0 0E+00
108883 Toluene	1 82E+02	8 70E+02	8 60E+06	5 26E+02	2 72E+01	6 63E+03	591 79	7 930	0 0E+00
108907 Chlorobenzene	2 19E+02	7 30E+02	8 70E+06	4 72E+02	1 52E+01	3 71E+03	632 40	8 410	0 0E+00
108952 Phenol	2 88E+01	8 20E+02	9 10E+06	8 28E+04	1 63E+05	3 98E+07	694 20	10 920	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E+02	7 53E+06	1 72E+04	7 38E+04	1 80E+05	859 79	9 000	3 3E+04
115297 Endosulfan	2 14E+03	1 15E+02	4 55E+06	5 10E+01	4 59E+04	1 12E+05	942 94	14 000	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E+02	3 66E+06	3 40E+01	4 18E+06	1 02E+07	806 00	15 999	4 0E+06
117840 Di-n-octyl phthalate	8 32E+07	1 51E+02	3 58E+06	2 00E+02	2 74E+03	6 68E+05	862 22	15 000	0 0E+00
118741 Hexachlorobenzene	5 50E+04	5 42E+02	5 91E+06	6 20E+00	5 41E+02	1 32E+03	825 00	14 447	4 6E+04
120127 Anthracene	2 95E+04	3 24E+02	7 74E+06	4 34E+02	2 67E+03	6 51E+05	873 00	13 121	0 0E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E+02	8 23E+06	3 00E+02	5 82E+02	1 42E+03	725 00	10 471	0 0E+00
120832 2,4-Dichlorophenol	1 47E+02	3 46E+02	8 77E+06	4 50E+03	1 30E+04	3 17E+06	708 17	11 000	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E+01	7 06E+06	2 70E+02	3 80E+06	9 27E+08	814 00	13 467	1 9E+04
124481 Chlorodibromomethane	6 31E+01	1 96E+02	1 05E+05	2 60E+03	3 21E+02	7 83E+04	678 20	8 000	2 4E+05
127184 Tetrachloroethylene	1 55E+02	7 20E+02	8 20E+06	2 00E+02	7 54E+01	1 84E+02	620 20	8 288	5 8E+07
129000 Pyrene	1 05E+05	2 72E+02	7 24E+06	1 35E+01	4 51E+04	1 10E+05	936 00	14 370	0 0E+00
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E+02	1 13E+05	3 50E+03	1 67E+01	4 07E+03	544 00	7 192	0 0E+00
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E+02	1 19E+05	6 30E+03	3 85E+01	9 39E+03	516 50	6 717	0 0E+00
193385 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E+02	5 66E+06	2 20E+05	6 56E+05	1 60E+06	1078 24	17 000	2 1E+04
205992 Benzo(b)fluoranthene	1 23E+06	2 26E+02	5 56E+06	1 50E+03	4 55E+03	1 11E+04	969 27	15 000	2 1E+04
206440 Fluoranthene	1 07E+05	3 02E+02	6 35E+06	2 08E+01	6 60E+04	1 61E+05	905 00	16 455	2 1E+06
207089 Benzo(k)fluoranthene	1 23E+06	2 26E+02	5 56E+06	8 00E+04	3 40E+05	8 29E+07	1019 70	16 000	2 1E+05
218019 Chrysene	3 98E+05	2 48E+02	6 21E+06	1 60E+03	3 88E+03	9 48E+05	979 00	13 000	4 9E+03
309002 Aldrin	2 45E+06	1 32E+02	4 86E+06	1 80E+01	6 97E+03	1 70E+04	839 37	13 000	1 8E+03
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E+02	7 34E+06	2 00E+00	4 35E+04	1 08E+05	839 36	13 000	5 3E+04
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E+02	7 34E+06	2 40E+01	3 05E+05	7 44E+07	839 36	13 000	5 3E+04
542756 1,3-Dichloropropane	4 57E+01	6 26E+02	1 00E+05	2 80E+03	7 26E+01	1 77E+02	597 38	7 000	3 7E+05
606202 2,6-Dinitrotoluene	6 92E+01	3 27E+02	7 26E+06	1 82E+02	3 06E+05	7 48E+07	770 00	12 938	1 9E+04
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E+02	8 17E+06	9 89E+03	9 23E+05	2 29E+06	746 87	11 000	2 0E+03
1024573 Heptachlor epoxide	8 32E+04	1 32E+02	4 23E+06	2 00E+01	3 90E+04	9 61E+06	848 76	13 000	2 6E+03
7439976 Mercury (elemental)	5 20E+01	3 07E+02	6 30E+06	5 62E+02	4 67E+01	1 14E+02	1750 00	14 127	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E+02	4 34E+06	7 40E+01	2 46E+04	6 00E+06	873 31	14 000	3 2E+04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E+02	4 32E+06	8 00E+02	1 89E+01	4 60E+03	539 37	19 000	1 0E+04
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E+02	5 00E+06	5 70E+02	8 20E+02	2 00E+03	512 27	19 000	1 0E+04
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E+02	5 42E+06	4 20E+01	1 19E+02	2 90E+04	475 22	18 000	1 0E+04
53469219 Aroclor 1242 (PCB-1242)	6 30E+04	2 14E+02	5 31E+06	3 40E+01	2 13E+02	5 20E+04	482 20	18 000	1 0E+04

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.,
 C_w
($\mu\text{g/L}$)

75092 9 843137255

Chemical

Methylene chloride

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	
16	15	1524	670.56	60.96	792.48	C	S	SI		
			Thickness of soil stratum A, (Enter value or 0) h_a (cm)		Thickness of soil stratum B, (Enter value or 0) h_b (cm)		Thickness of soil stratum C, (Enter value or 0) h_c (cm)			
			Totals must add up to value of L_{wt} (cell D28)							
			Soil stratum directly above water table, (Enter A, B, or C)		SCS soil type directly above water table		SCS soil type (used to estimate soil vapor permeability)		User-defined stratum A SCS soil vapor permeability, k_v (cm^2)	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_d^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_d^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_d^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	ENTER
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_b (cm)	Enclosed space width, W_b (cm)	Enclosed space height, H_b (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	ENTER	ENTER	ENTER
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based
groundwater concentration

7041404

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., R(C) (mg/m^3)
1.01E-01	1.17E-05	2.19E-03	25	6.706	313.00	510.00	1.17E+01	1.30E+04	4.7E-07	3.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9 48E+08	1509	0 230	0 150	0 130	0 419	9 38E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3 844
Source-building separation, L_r (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{ro} (cm^2)	Stratum A soil effective permeability, k_e (cm^2)	Thickness of capillary zone, L_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
Bldg ventilation rate, $Q_{venting}$ (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{ca} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5 63E+04	9 24E+05	4 18E-04	15	6 970	1 52E-03	6 40E-02	1 77E-04	4 10E-03	1 06E-03	6 30E-04	7 23E-04	1 02E-03	1509
Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)			Crack-to-total area ratio, η (unitless)	Average vapor flow rate into bldg, Q_{vld} (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., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RfC (mg/m ³)			
	15	6 40E+01	0 10	6 67E-01	4 10E-03	3 84E+02	5 74E+02	5 74E-06	3 67E-04	4 7E-07	3 0E+00			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen ($\mu\text{g/L}$)	Indoor exposure groundwater conc., noncarcinogen ($\mu\text{g/L}$)	Risk-based indoor exposure groundwater conc., ($\mu\text{g/L}$)	Pure component water solubility, S ($\mu\text{g/L}$)	Final indoor exposure groundwater conc., ($\mu\text{g/L}$)
1.41E+04	8.51E+06	1.41E+04	1.30E+07	1.41E+04

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS.

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

VLOOKUP TABLES

SCS Soil Type		Soil Properties Lookup Table					Chemical Properties Lookup Table	
CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)
50293 DDT	2,635+06	0.20	1.09	0.083	0.38	0.068	8.10E-06	25
50328 Benzo(a)pyrene	1.02E+06	0.08	0.083	0.38	0.068	0.0092	1.13E-06	25
51285 2,4-Dinitrophenol	1.00E-02	0.19	1.31	0.237	0.41	0.095	4.44E-07	25
53703 Dibenz(a,h)anthracene	3.80E+06	0.036	1.56	0.359	0.43	0.078	1.47E-08	25
56235 Carbon tetrachloride	1.74E+02	0.124	2.28	0.561	0.41	0.057	3.05E-02	25
56553 Benz(a)anthracene	3.98E+05	0.145	2.68	0.627	0.43	0.045	3.34E-06	25
57749 Chlordane	1.20E+05	0.027	1.23	0.187	0.38	0.100	1.51E-05	25
58899 gamma-HCH (Lindane)	1.07E+03	0.059	1.48	0.324	0.39	0.100	1.40E-05	25
60571 Dieldrin	2.14E+04	0.016	1.37	0.270	0.46	0.034	1.54E-06	25
65850 Benzoic Acid	6.00E-01	0.025	1.09	0.083	0.26	0.070	3.88E-05	25
67641 Acalone	5.75E-01	0.005	1.09	0.083	0.26	0.070	3.88E-05	25
67663 Chloroform	3.98E+01	0.007	1.23	0.187	0.43	0.089	8.80E-06	25
67721 Hexachloroethane	6.92E+00	0.045	0.020	0.291	0.45	0.067	5.56E-03	25
71363 Butanol	1.10E+02	0.020	1.41	0.291	0.45	0.067	1.72E-02	25
71432 Benzene	5.89E+01	0.075	1.89	0.471	0.41	0.065	7.51E-06	25
71556 1,1,1-Trichloroethane	1.23E+04	0.008	1.09	0.083	0.38	0.068	1.72E-02	25
72208 Endrin	1.00E+06	0.019	1.31	0.237	0.41	0.095	7.51E-06	25
72435 Methoxychlor	9.77E+04	0.036	1.56	0.359	0.43	0.078	1.47E-08	25
72548 DDD	4.47E+06	0.027	1.23	0.187	0.38	0.100	3.05E-02	25
72559 DDE	1.05E+01	0.059	1.48	0.324	0.39	0.100	3.34E-06	25
74839 Methyl bromide	1.86E+01	0.016	1.37	0.270	0.46	0.034	1.51E-05	25
75014 Vinyl chloride (chloroethene)	1.17E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25
75092 Methylene chloride	4.57E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25
75150 Carbon disulfide	8.71E+01	0.059	1.48	0.324	0.39	0.100	3.34E-06	25
75252 Bromoform	5.50E+01	0.016	1.37	0.270	0.46	0.034	1.51E-05	25
75274 Bromodichloromethane	3.16E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25
75343 1,1-Dichloroethane	5.89E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25
75354 1,1-Dichloroethylene	1.41E+06	0.059	1.48	0.324	0.39	0.100	3.34E-06	25
76448 Heptachlor	2.00E+05	0.016	1.37	0.270	0.46	0.034	1.51E-05	25
77474 Hexachlorocyclopentadiene	4.68E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25
78591 Isophorone	4.37E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25
78875 1,2-Dichloropropane	5.01E+01	0.059	1.48	0.324	0.39	0.100	3.34E-06	25
79005 1,1,2-Trichloroethane	1.86E+02	0.016	1.37	0.270	0.46	0.034	1.51E-05	25
79016 Trichloroethylene	9.33E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25
79345 1,1,2,2-Tetrachloroethane	7.08E+03	0.027	1.23	0.187	0.38	0.100	3.05E-02	25
83329 Acenaphthene							1.55E-04	25

CAS No	Chemical	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, UR _F (μg/m ³) ⁻¹	Reference conc, R _{IC} (mg/m ³)
50293 DDT	2,635+06	0.20	1.09	0.083	0.38	0.068	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328 Benzo(a)pyrene	1.02E+06	0.08	0.083	0.38	0.068	0.0092	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285 2,4-Dinitrophenol	1.00E-02	0.19	1.31	0.237	0.41	0.095	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703 Dibenz(a,h)anthracene	3.80E+06	0.036	1.56	0.359	0.43	0.078	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235 Carbon tetrachloride	1.74E+02	0.124	2.28	0.561	0.41	0.057	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553 Benz(a)anthracene	3.98E+05	0.145	2.68	0.627	0.43	0.045	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749 Chlordane	1.20E+05	0.027	1.23	0.187	0.38	0.100	1.51E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
58899 gamma-HCH (Lindane)	1.07E+03	0.059	1.48	0.324	0.39	0.100	1.40E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
60571 Dieldrin	2.14E+04	0.016	1.37	0.270	0.46	0.034	1.51E-05	25	720.00	751.00	10,000	0.0E+00	1.4E+01
65850 Benzoic Acid	6.00E-01	0.025	1.09	0.083	0.26	0.070	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67641 Acalone	5.75E-01	0.005	1.09	0.083	0.26	0.070	3.88E-05	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67663 Chloroform	3.98E+01	0.007	1.23	0.187	0.43	0.089	8.80E-06	25	350.88	563.05	9,510	4.0E-06	0.0E+00
67721 Hexachloroethane	6.92E+00	0.045	0.020	0.291	0.45	0.067	5.56E-03	25	374.24	562.16	7,342	8.3E-06	0.0E+00
71363 Butanol	1.10E+02	0.075	1.89	0.471	0.41	0.065	1.72E-02	25	718.15	545.00	7,136	0.0E+00	1.0E+00
71432 Benzene	5.89E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25	651.02	848.49	14,000	0.0E+00	1.8E-02
71556 1,1,1-Trichloroethane	1.23E+04	0.008	1.09	0.083	0.38	0.068	1.13E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72208 Endrin	1.00E+06	0.019	1.31	0.237	0.41	0.095	4.44E-07	25	276.71	467.00	5,714	0.0E+00	5.0E-03
72435 Methoxychlor	9.77E+04	0.036	1.56	0.359	0.43	0.078	1.47E-08	25	319.00	510.00	6,706	4.7E-07	3.0E+00
72548 DDD	4.47E+06	0.027	1.23	0.187	0.38	0.100	3.05E-02	25	422.35	698.00	6,391	0.0E+00	7.0E-01
72559 DDE	1.05E+01	0.059	1.48	0.324	0.39	0.100	3.34E-06	25	585.85	700.00	7,000	1.8E-05	0.0E+00
74839 Methyl bromide	1.86E+01	0.016	1.37	0.270	0.46	0.034	1.51E-05	25	304.75	576.05	6,895	0.0E+00	5.0E-01
75014 Vinyl chloride (chloroethene)	1.17E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25	603.69	848.31	13,000	1.3E-03	0.0E+00
75092 Methylene chloride	4.57E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25	512.15	748.00	10,931	0.0E+00	7.0E-05
75150 Carbon disulfide	8.71E+01	0.059	1.48	0.324	0.39	0.100	3.34E-06	25	498.35	715.00	10,271	2.7E-07	0.0E+00
75252 Bromoform	5.50E+01	0.016	1.37	0.270	0.46	0.034	1.51E-05	25	369.52	572.00	7,590	0.0E+00	4.0E-03
75274 Bromodichloromethane	3.16E+01	0.005	1.09	0.083	0.26	0.070	1.54E-06	25	386.15	602.00	8,322	1.8E-05	0.0E+00
75343 1,1-Dichloroethane	5.89E+01	0.027	1.23	0.187	0.38	0.100	3.05E-02	25	360.38	544.20	7,505	1.7E-06	0.0E+00
75354 1,1-Dichloroethylene	1.41E+06	0.059	1.48	0.324	0.39	0.100	3.34E-06	25	419.60	661.15	8,996	5.9E-05	0.0E+00
76448 Heptachlor	2.00E+05	0.016	1.37	0.270	0.46	0.034	1.51E-05	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84682 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 8E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 80	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	799 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	838 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	7 50E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E+01
91841 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	2 60E+04	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	4 92E+05	2 13E-01	1 20E-06	25	464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 8E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	9 84E-04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 89E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E+02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	25	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E+01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	581 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E+01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	5 26E+02	3 01E-01	6 63E-03	25	412 27	617 05	7 930	0 0E+00	4 0E+01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	2 72E-01	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E+01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E+02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E+02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15 989	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorobromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
129009 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E+01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 8E+02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 38E-03	25	320 85	516 50	6 717	0 0E+00	7 0E+02
183395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 86E-06	2 20E-05	6 86E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzobifluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1079 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 48E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 08E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E+02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	2 45E-06	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodipropylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-06	25	509 60	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469218 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☐ X ☒ OR

VERSION 1.2
September, 1998

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

YES ☐

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Chemical CAS No (numbers only, no dashes)	Initial groundwater conc, C_w ($\mu\text{g/L}$)	Chemical	trans-1,2-Dichloroethylene						
156605	10 70764706								
ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_F (cm)	Depth below grade to water table, L_{WT} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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, k_v) (cm^2)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48	C	S	SI	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	0.43	1.7	0.43	0.3

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_B (cm)	Enclosed space floor width, W_B (cm)	Enclosed space height, H_B (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based groundwater concentration

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc., RIC (mg/m^3)
7.07E-02	1.19E-05	9.39E-03	25	6.717	320.85	516.50	5.25E+01	6.30E+03	0.0E+00	7.0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_T (cm)														
Stratum A air-filled porosity, θ_a^A (cm ³ /cm ³)														
Stratum B air-filled porosity, θ_a^B (cm ³ /cm ³)														
Stratum C soil air-filled porosity, θ_a^C (cm ³ /cm ³)														
Stratum A effective total fluid saturation, S_{se} (cm ³ /cm ³)														
Stratum A intrinsic permeability, k_i (cm ²)														
Stratum A soil relative permeability, k_{rg} (cm ²)														
Stratum A effective vapor permeability, k_v (cm ²)														
Thickness of capillary zone, L_c (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_{seam} (cm)														
Bldg ventilation rate, $Q_{building}$ (cm ³ /s)														
Area of enclosed space below grade, A_g (cm ²)														
Crack-to-total area ratio, η (unitless)														
Crack depth below grade, Z_{crack} (cm)														
Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)														
Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)														
Henry's law constant at ave groundwater temperature, H'_{rs} (unitless)														
Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)														
Stratum A effective diffusion coefficient, D^{eff}_A (cm ² /s)														
Stratum B effective diffusion coefficient, D^{eff}_B (cm ² /s)														
Stratum C effective diffusion coefficient, D^{eff}_C (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)														
Diffusion path length, L_d (cm)														
Convection path length, L_p (cm)														
Source vapor conc, C_{source} (ug/m ³)														
Average vapor flow rate into bldg, Q_{avg} (cm ³ /s)														
Crack radius, r_{crack} (cm)														
Crack effective diffusion coefficient, D_{crack} (cm ² /s)														
Exponent of equivalent foundation Peclet number, $\exp(Pe)$ (unitless)														
Infinite source indoor attenuation coefficient, α (unitless)														
Infinite source bldg conc, $C_{building}$ (ug/m ³)														
Unit risk factor, URF (ug/m ³) ⁻¹														
Reference conc, RIC (mg/m ³)														
15	2.73E+02	0.10	6.67E-01	2.87E-03	3.84E+02	8.80E+03	4.65E-06	1.27E-03	NA	7.0E-02				

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
NA	5.75E+04	5.75E+04	6.30E+06	5.75E+04

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	θ_r (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.581	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No.	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H ⁺ (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Normal boiling point, T _b (°C)	Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(b)pyrene	1.02E+08	4.30E-02	9.00E-06	1.62E-03	1.82E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E+03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
55235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.23E-03	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benzo(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	586.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	8.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E-03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E-01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	5.56E-03	25	353.24	562.16	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E-01	8.80E-02	9.80E-06	1.75E-03	2.28E-01	1.72E-02	25	390.88	563.05	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E-03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E+03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75032	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E-03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E-03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E-03	6.58E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E-03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E-03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	745.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	8.76E-06	1.20E-04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E-03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E-03	3.74E-02	9.12E-04	25	388.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.68E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E+01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 58E-02	6 35E-06	1 08E+03	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Florene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 34E+01	8 15E-03	25	486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	2 44E-08	25	562 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	4 83E-04	25	491 14	748 40	10 373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	6 70E-02	1 78E-06	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	4 92E-05	1 20E-08	25	464 19	697 60	10 800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	3 90E-04	25	447 53	675 00	9 572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	4 34E-06	25	526 15	759 13	13 000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	8 00E-06	1 69E+02	7 89E-03	25	409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	2 00E-06	25	484 13	707 60	11 329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	9 78E-04	25	356 65	581 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	5 26E+02	6 63E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108807 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	25	455 02	694 20	10 920	0 0E+00	2 1E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	1 80E-05	25	674 43	823 00	14 000	0 0E+00	2 1E-02
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 12E-05	25	657 15	806 00	15 959	4 0E-06	0 0E+00
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	1 02E-07	25	582 55	875 00	14 447	4 6E-04	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	1 32E-03	25	582 55	875 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	6 51E-05	25	615 18	823 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	1 42E-03	25	486 15	725 00	10 471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	3 17E-06	25	482 15	708 17	11 000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	9 27E-08	25	590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 03E-05	2 60E+03	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	1 84E-02	25	384 40	620 20	8 288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	1 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	1 60E-06	25	809 15	1078 24	17 000	2 1E-04	0 0E+00
205992 Benzoc(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	1 11E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
207088 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	1 06E-05	25	596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	7 44E-07	25	596 55	839 36	13 000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	1 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 51E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-08	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

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

YES

X

OR

YES

VERSION 1.2
September, 1998

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

ENTER Initial groundwater conc. C_w (numbers only, no dashes) ($\mu\text{g/L}$)

Chemical

156592 6 171851852

cis-1,2-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade to bottom of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	Soil stratum directly above water table, (Enter A, B, or C)	SCS soil type directly above water table	SCS soil type (used to estimate soil vapor permeability, k_v)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48	C	S	SI	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A bulk density, ρ_A (g/cm^3)	Stratum A porosity, n_A (unitless)	Stratum A soil dry bulk density, ρ_{dA} (g/cm^3)	Stratum A soil total porosity, n_A^t (unitless)	Stratum B soil dry bulk density, ρ_{dB} (g/cm^3)	Stratum B soil total porosity, n_B^t (unitless)	Stratum B soil water-filled porosity, θ_{wB} (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_{dC} (g/cm^3)	Stratum C soil total porosity, n_C^t (unitless)	Stratum C soil water-filled porosity, θ_{wC} (cm^3/cm^3)
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{encl} (cm)	Soil-bldg pressure differential, ΔP (g/cm^2)	Enclosed space floor length, L_e (cm)	Enclosed space floor width, W_e (cm)	Enclosed space height, H_e (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)	
15	40	961	961	488	0.1	0.45	

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

Used to calculate risk-based groundwater concentration

1 of 7

7041415

7041416

CHEMICAL PROPERTIES SHEET

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)	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ¹ (ug/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
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

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	9.46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Source-building separation, L_r (cm)			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{at} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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 penmeter, X_{crack} (cm)
Bldg ventilation rate, Q_{bldg} (cm^3/s)		Area of enclosed space below grade, A_g (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 (cal/mol)	Henry's law constant at ave groundwater temperature, H_{Ts} (atm-m ³ /mol)	Henry's law constant at ave groundwater temperature, $H'T_s$ (unitless)	Vapor viscosity at ave soil temperature, μ_{Ts} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (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)	Diffusion path length, L_d (cm)
Convection path length, L_p (cm)	5.63E+04	9.24E+05	4.16E-04	15	7.674	2.72E-03	1.15E-01	1.77E-04	2.98E-03	7.60E-04	4.58E-04	5.24E-04	7.42E-04	1509
Source vapor conc, C_{source} ($\mu\text{g}/\text{m}^3$)		Average vapor flow rate into bldg, Q_{avg} (cm^3/s)	Crack radius, r_{crack} (cm)	Crack effective diffusion coefficient, D^{eff}_{crack} (cm^2/s)	Crack area, 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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\text{-}^{-1}$)	Reference conc, RIC (mg/m ³)				
	15	1.15E+02	0.10	6.67E-01	2.98E-03	3.84E+02	6.13E+03	4.80E-06	5.50E-04	NA	3.5E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., (µg/L)	Indoor exposure groundwater conc., (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	6.64E+04	6.64E+04	3.50E+06	6.64E+04

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Soil Properties Lookup Table						
SCS Soil Type	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.083	0.38	0.068
CL	0.26	0.019	1.31	0.237	0.41	0.095
L	1.04	0.036	1.56	0.359	0.43	0.078
LS	14.59	0.124	2.28	0.561	0.41	0.057
S	29.70	0.145	2.68	0.627	0.43	0.045
SC	0.12	0.027	1.23	0.187	0.38	0.100
SCL	1.31	0.059	1.48	0.324	0.39	0.100
SI	0.25	0.016	1.37	0.270	0.46	0.034
SIC	0.02	0.005	1.09	0.083	0.26	0.070
SICL	0.07	0.010	1.23	0.187	0.43	0.089
SIL	0.45	0.020	1.41	0.291	0.45	0.067
SL	4.42	0.075	1.89	0.471	0.41	0.065

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RfC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	8.80E-06	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E-04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E-03	1.11E+00	2.71E-02	25	259.25	432.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	4.57E+01	1.04E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	696.00	9,479	1.1E-06	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	9.12E-04	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84862 Diethylphthalate	2 88E+02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	7 86E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	4 83E-06	2 69E+02	5 17E-05	1 26E-06	660 80	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	7 88E-06	1 98E+00	2 81E-03	6 37E-05	25 570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	7 03E-06	7 03E+00	6 26E-07	1 53E-08	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 61E-02	6 18E-06	3 23E+00	3 34E-01	8 15E-03	25 486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25 519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25 491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,5-Dichlorobenzidine	7 24E+02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	25 560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E+05	2 13E-01	5 20E-03	25 417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25 464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25 453 57	705 00	9,700	0 0E+00	2 0E-01
95576 2-Chlorophenol	3 88E+02	5 01E-02	2 20E+04	1 60E-02	3 90E-04	25 447 53	675 00	8,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	1 20E+03	1 78E-04	4 34E-06	25 526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	2 40E-05	25 483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E+02	3 23E-01	7 88E-03	25 409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	3 10E+02	1 13E-01	2 78E-03	25 418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	7 87E+03	8 20E-05	2 00E-06	25 484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	1 85E+02	3 14E-01	7 66E-03	26 411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	7 90E-06	7 38E+01	9 96E-02	2 43E-07	25 447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	5 30E+03	1 36E-05	3 32E-07	25 503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	8 52E+03	4 01E-02	9 78E-04	25 356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	2 00E+04	2 10E-02	5 12E-04	25 345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25 412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	5 28E+02	2 72E-01	6 63E-03	25 383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25 404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	8 28E+04	1 63E-05	3 98E-07	25 451 15	659 79	9,000	3 3E-04	0 0E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	1 72E+04	7 38E-04	1 80E-05	25 455 02	684 20	10,920	0 0E+00	2 1E+00
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	1 12E-05	25 674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	1 02E-07	25 657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	6 68E-05	25 704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	5 41E-02	1 32E-03	25 582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	2 67E-03	6 51E-05	25 615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	1 42E-03	25 486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	4 50E+03	1 30E-04	6 12E-05	25 482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	2 70E+02	3 80E-06	9 27E-08	25 590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 08E-05	2 60E+03	7 83E-04	25 416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	2 00E+02	7 54E-01	1 84E-02	25 394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	7 22E-02	7 24E-06	4 51E-04	1 10E-05	25 867 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	3 50E+03	1 67E-01	4 07E-03	25 333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	6 30E+03	3 85E-01	9 39E-03	25 320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	1 60E-06	25 809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	1 11E-04	25 715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	1 61E-05	25 655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	8 29E-07	25 753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-04	9 46E-05	25 603 01	839 37	13,000	4 9E-03	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	1 70E-04	25 839 36	839 36	13,000	1 8E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	7 44E-07	25 596 55	839 36	13,000	5 3E-04	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	7 44E-07	25 596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 28E-02	1 00E-05	2 80E+03	1 77E-02	25 381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 28E-06	1 82E+02	7 46E-07	25 558 00	770 00	12,938	1 9E-04	0 0E+00
821647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 88E+03	2 25E-06	25 509 60	748 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	9 51E-06	25 613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	9 51E-06	25 629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-06	25 657 15	873 31	14,000	3 2E-04	0 0E+00
1109625 Aroclor 1260 (PCB-1260)	2 57E+05	1 16E-02	4 34E-06	7 40E-01	6 00E-06	25 657 15	873 31	14,000	3 2E-04	0 0E+00
1109769 Aroclor 1254 (PCB-1254)	2 90E+05	1 38E-02	4 32E-06	1 89E-01	4 60E-03	25 402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 00E+05	1 56E-02	5 70E-02	8 20E-02	2 00E-03	25 377 50	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	2 90E-04	25 340 50	475 22	18,000	1 0E-04	0 0E+00
		2 14E-02	3 40E-01	2 13E-02	5 20E-04	25 345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

VERSION 1.2
September, 1998

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

YES ☒ X

OR

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

YES ☐

ENTER
Chemical
CAS No
(numbers only,
no dashes)

ENTER
Initial
groundwater
conc.
 C_w
($\mu\text{g/L}$)

Chemical

75354 19 67987179

1,1-Dichloroethylene

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Average soil/ groundwater temperature, T_s ($^{\circ}\text{C}$)	Depth below grade of enclosed space floor, L_f (cm)	Depth below grade to water table, L_{wt} (cm)	Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, h_B (cm)	Thickness of soil stratum C, h_C (cm)	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)	User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670.56	60.96	792.48	C	S	SI	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A soil dry bulk density, ρ_s^A (g/cm^3)	Stratum A soil total porosity, n^A (unitless)	Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	Stratum B soil dry bulk density, ρ_s^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	Stratum C soil dry bulk density, ρ_s^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	
1.5	0.43	0.2	1.7	0.42	0.27	1.7	0.43	0.3	

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space thickness, L_{enc} (cm)	Soil-bldg pressure differential, ΔP ($\text{g/cm}^2\text{-s}^2$)	Enclosed space floor length, L_a (cm)	Enclosed space floor width, W_a (cm)	Enclosed space height, H_a (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)			
15	40	961	961	488	0.1	0.45			

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

Used to calculate risk-based
groundwater concentration

7041422

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,s}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) $^{-1}$	Reference conc., R/C (mg/m^3)
9.00E-02	1.04E-05	2.61E-02	25	6.247	304.75	576.05	5.89E+01	2.25E+03	5.0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_r (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{fa} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_a (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, l_{ca} (cm)	Total porosity in capillary zone, n_{ca} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,ca}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,ca}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 48E+08	1509	0.230	0.150	0.130	0.419	9 36E-10	0.746	6 98E-10	17.05	0.43	0.136	0.294	3,844
Bldg ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_g (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave groundwater temperature, $\Delta H_{v,rs}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{rs} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave groundwater temperature, H_{rs} (unitless)	Vapor viscosity at ave soil temperature, μ_{rs} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (cm^2/s)	Capillary zone effective diffusion coefficient, D_{eff}^{ca} (cm^2/s)	Total overall effective diffusion coefficient, D_{eff}^T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 18E-04	15	6,353	1 87E-02	7 88E-01	1.77E-04	3 65E-03	9 22E-04	5 47E-04	6 30E-04	8 92E-04	1509
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	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 number, $\exp(Pe)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{s}^{-1}$)	Reference conc., RfC (mg/m^3)			
15	7.88E+02	0.10	6 67E-01	3 65E-03	3 84E+02	1 26E+03	5 33E-06	4.20E-03	5.0E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater carcinogen (ug/L)	Indoor exposure groundwater conc. noncarcinogen (ug/L)	Risk-based indoor exposure groundwater conc. (ug/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc. (ug/L)
1.16E+01	NA	1.16E+01	2.25E+06	1.16E+01

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

VLOOKUP TABLES

SCS Soil Type	Soil Properties Lookup Table				Chemical Properties Lookup Table		
	K _s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ _s (cm ³ /cm ³)	θ _i (cm ³ /cm ³)	Mean Grain Diameter (cm)
C	0.20	0.008	1.09	0.83	0.38	0.068	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030

CAS No	Chemical	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's Law Constants			Critical temperature, T _c (°C)	Enthalpy of vaporization at the normal boiling point, ΔH _{v,s} (cal/mol)	Unit risk factor, URF (μg/m ³) ⁻¹	Reference conc., R/C (mg/m ³)
						Henry's law constant at reference temperature, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Normal boiling point, T _b (°C)				
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.82E-03	4.63E-05	1.13E-06	25	715.90	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E-02	1.25E+00	3.05E-02	25	349.90	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-02	4.85E-05	25	624.24	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	13,000	4.6E-03	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	10,000	0.0E+00	1.4E+01
65850	Benzic Acid	5.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	508.10	0.0E+00	3.5E-01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	334.32	6,988	2.3E-05	0.0E+00
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.88E-03	25	458.00	9,510	4.0E-06	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	390.88	10,346	0.0E+00	3.5E-01
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E-04	3.61E-04	5.66E-03	25	353.24	7,342	8.3E-06	0.0E+00
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	0.0E+00	1.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	718.15	12,000	0.0E+00	1.1E-03
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	651.02	14,000	0.0E+00	1.8E-02
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	639.90	14,000	6.9E-05	0.0E+00
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	860.38	13,000	9.7E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	5,714	0.0E+00	5.0E-03
74839	Methyl bromide	1.03E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	5,250	8.4E-05	0.0E+00
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	6,706	4.7E-07	3.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	6,391	0.0E+00	7.0E-01
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	422.35	6,960	1.1E-06	0.0E+00
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	363.15	7,000	1.8E-05	0.0E+00
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.08E-05	6.74E+03	6.56E-02	5.61E-03	25	330.55	6,895	0.0E+00	5.0E-01
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.08E+05	2.30E-01	2.61E-02	25	304.75	6,247	5.0E-05	0.0E+00
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	603.69	13,000	1.3E-03	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	2.71E-02	25	512.15	10,931	0.0E+00	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	6.63E-06	25	488.35	10,271	2.7E-07	0.0E+00
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	2.72E-04	2.80E-03	25	369.52	7,590	0.0E+00	4.0E-03
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.80E-06	2.80E+03	1.15E-01	9.12E-04	25	386.15	8,322	1.8E-05	0.0E+00
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	1.03E-02	25	360.36	7,505	1.7E-06	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	3.44E-04	25	419.60	8,996	5.8E-05	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	1.55E-04	25	550.54	12,155	0.0E+00	2.1E-01
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03						

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 89E+00	5 17E-05	1 26E-06	25 660 60	839 68	13 000	0 0E+00	7 0E+01
86306 N-Nitrosodiphenylamine	1 28E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25 632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 83E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25 570 44	870 00	12 666	0 0E+00	1 4E+01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25 627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 37E+00	3 34E-01	8 15E-03	25 486 15	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25 582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+03	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25 519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	7 50E-06	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25 491 14	748 40	10 373	0 0E+00	1 4E+01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25 560 26	764 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25 417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25 464 19	697 60	10 800	0 0E+00	1 8E+01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25 453 57	705 00	9 700	0 0E+00	2 0E+01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	25 447 53	675 00	9 572	0 0E+00	1 8E+02
95954 2,4,5-Trichlorophenol	1 80E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25 526 15	759 13	13 000	0 0E+00	3 5E+01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25 483 95	719 00	10 566	0 0E+00	2 0E+03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 89E+02	3 23E-01	7 88E-03	25 409 34	617 20	8 501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 78E-03	25 418 31	636 00	11 329	0 0E+00	7 0E+02
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 89E-06	7 87E+03	8 20E-05	2 00E-06	25 484 13	707 60	8 737	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 68E-03	25 411 52	616 20	9 271	0 0E+00	8 0E+01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25 447 21	684 75	8 525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25 503 65	754 00	11 689	0 0E+00	1 4E+02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 79E-04	25 356 65	561 00	7 643	2 6E-05	0 0E+00
5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	5 12E-04	25 345 65	519 13	7 800	0 0E+00	2 0E+01
4 07E+02	7 00E-02	7 80E-06	1 81E+02	3 01E-01	3 71E-03	3 71E-03	25 455 02	634 20	8 410	0 0E+00	2 0E+02
108883 Toluene	1 82E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	6 63E-03	25 383 78	591 79	7 930	0 0E+00	4 0E+01
2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	1 80E-05	6 63E-03	25 455 02	634 20	8 410	0 0E+00	2 0E+02
108907 Chlorobenzene	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	1 32E-05	25 582 55	825 00	14 447	4 6E-04	0 0E+00
11444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25 451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25 674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25 657 15	806 00	15 989	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25 704 09	862 22	15 000	0 0E+00	7 0E+02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-05	25 582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25 615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25 486 15	725 00	10 471	0 0E+00	2 0E+01
120832 2,4-Dichlorophenol	1 47E+02	3 48E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25 482 15	708 17	11 000	0 0E+00	1 1E+02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25 590 00	814 00	13 467	1 9E-04	0 0E+00
124481 Chlorobromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25 416 14	678 20	8 000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25 394 40	620 20	8 268	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25 667 95	936 00	14 370	0 0E+00	1 1E+01
155592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25 333 65	544 00	7 192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25 320 65	516 50	6 717	0 0E+00	7 0E+02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E+05	6 56E-05	1 60E-06	25 809 15	1078 24	17 000	2 1E-04	0 0E+00
205982 Benzot(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25 715 90	969 27	15 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 08E-01	6 60E-04	1 61E-05	25 655 95	905 00	13 815	0 0E+00	1 4E+01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25 753 15	1019 70	16 455	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25 714 15	979 00	16 000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	8 97E-03	1 70E-04	25 603 01	839 37	13 000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 04E-05	25 596 55	839 36	13 000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25 596 55	839 36	13 000	1 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25 381 15	587 38	7 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	8 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	2 46E-07	25 558 00	770 00	12 938	1 9E-04	0 0E+00
621647 N-Nitrosodip-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25 509 60	746 87	11 000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25 613 96	868 76	13 000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25 629 88	1750 00	14 127	0 0E+00	3 0E+04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25 657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25 402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25 377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25 340 50	475 22	18 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	4 30E-01	2 13E-02	5 20E-04	25 345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

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

YES ☐ X ☐

OR

YES ☐VERSION 1.2
September, 1998

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

ENTER
InitialChemical
CAS No
(numbers only,
no dashes)groundwater
conc.C_w

(μg/L)

107062 3 822307692

Chemical

1,2-Dichloroethane

ENTER
Average
groundwater
temperature,
T_s

(°C)

ENTER
Depth
below grade
to bottom
of enclosed
space floor,
L_f

(cm)

ENTER
Depth
below grade
to water table,
L_{wt}

(cm)

ENTER
Thickness
of soil
stratum A,
(Enter value or 0)h_A

(cm)

ENTER
Thickness
of soil
stratum B,
(Enter value or 0)h_B

(cm)

ENTER
Thickness
of soil
stratum C,
(Enter value or 0)h_C

(cm)

ENTER
Totals must add up to value of L_{wt} (cell D28)

792.48

ENTER
Soil
stratum
directly above
water table,
(Enter A, B, or C)

C

ENTER
Soil
stratum A
SCS
soil type
(used to estimate
soil vapor
permeability)

SI

ENTER
User-defined
stratum A
soil vapor
permeability,
k_v(cm²)ENTER
Soil
stratum A
SCS
soil type
(used to estimate
soil vapor
permeability)

SI

ENTER
User-defined
stratum A
soil vapor
permeability,
k_v(cm²)ENTER
Soil
stratum A
SCS
soil type
(used to estimate
soil vapor
permeability)

SI

ENTER
User-defined
stratum A
soil vapor
permeability,
k_v(cm²)ENTER
Soil
stratum A
SCS
soil type
(used to estimate
soil vapor
permeability)

SI

ENTER
User-defined
stratum A
soil vapor
permeability,
k_v(cm²)ENTER
Soil
stratum A
SCS
soil type
(used to estimate
soil vapor
permeability)

SI

ENTER
User-defined
stratum A
soil vapor
permeability,
k_v(cm²)ENTER
Stratum A
soil dry
bulk density,
ρ_s^A(g/cm³)ENTER
Stratum A
soil total
porosity,
n^A

(unitless)

ENTER
Stratum A
soil water-filled
porosity,
θ_w^A(cm³/cm³)ENTER
Stratum A
bulk density,
ρ_b^A(g/cm³)ENTER
Stratum A
soil dry
porosity,
n^A

(unitless)

ENTER
Stratum A
soil total
porosity,
θ_w^A(cm³/cm³)ENTER
Stratum A
bulk density,
ρ_b^A(g/cm³)ENTER
Stratum A
soil dry
porosity,
n^A

(unitless)

ENTER
Stratum A
soil total
porosity,
θ_w^A(cm³/cm³)ENTER
Stratum A
bulk density,
ρ_b^A(g/cm³)ENTER
Stratum A
soil dry
porosity,
n^A

(unitless)

ENTER
Stratum A
soil total
porosity,
θ_w^A(cm³/cm³)ENTER
Stratum A
bulk density,
ρ_b^A(g/cm³)ENTER
Stratum A
soil dry
porosity,
n^A

(unitless)

ENTER
Stratum A
soil total
porosity,
θ_w^A(cm³/cm³)ENTER
Stratum B
soil dry
bulk density,
ρ_s^B(g/cm³)ENTER
Stratum B
soil total
porosity,
n^B

(unitless)

ENTER
Stratum B
soil water-filled
porosity,
θ_w^B(cm³/cm³)ENTER
Stratum B
bulk density,
ρ_b^B(g/cm³)ENTER
Stratum B
soil dry
porosity,
n^B

(unitless)

ENTER
Stratum B
soil total
porosity,
θ_w^B(cm³/cm³)ENTER
Stratum B
bulk density,
ρ_b^B(g/cm³)ENTER
Stratum B
soil dry
porosity,
n^B

(unitless)

ENTER
Stratum B
soil total
porosity,
θ_w^B(cm³/cm³)ENTER
Stratum B
bulk density,
ρ_b^B(g/cm³)ENTER
Stratum B
soil dry
porosity,
n^B

(unitless)

ENTER
Stratum C
soil dry
bulk density,
ρ_s^C(g/cm³)ENTER
Stratum C
soil total
porosity,
n^C

(unitless)

ENTER
Stratum C
soil water-filled
porosity,
θ_w^C(cm³/cm³)ENTER
Stratum C
bulk density,
ρ_b^C(g/cm³)ENTER
Stratum C
soil dry
porosity,
n^C

(unitless)

ENTER
Stratum C
soil total
porosity,
θ_w^C(cm³/cm³)ENTER
Stratum C
bulk density,
ρ_b^C(g/cm³)ENTER
Stratum C
soil dry
porosity,
n^C

(unitless)

ENTER
Stratum C
soil total
porosity,
θ_w^C(cm³/cm³)ENTER
Stratum C
bulk density,
ρ_b^C(g/cm³)ENTER
Stratum C
soil dry
porosity,
n^C

(unitless)

ENTER
Stratum C
soil dry
bulk density,
ρ_s^C(g/cm³)ENTER
Stratum C
soil total
porosity,
n^C

(unitless)

ENTER
Stratum C
soil water-filled
porosity,
θ_w^C(cm³/cm³)ENTER
Stratum C
bulk density,
ρ_b^C(g/cm³)ENTER
Stratum C
soil dry
porosity,
n^C

(unitless)

ENTER
Stratum C
soil total
porosity,
θ_w^C(cm³/cm³)ENTER
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bulk density,
ρ_b^C(g/cm³)ENTER
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soil dry
porosity,
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(unitless)

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soil dry
porosity,
n^C

(unitless)

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soil dry
bulk density,
ρ_s^C(g/cm³)ENTER
Stratum C
soil total
porosity,
n^C

(unitless)

ENTER
Stratum C
soil water-filled
porosity,
θ_w^C(cm³/cm³)ENTER
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bulk density,
ρ_b^C(g/cm³)ENTER
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soil dry
porosity,
n^C

(unitless)

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soil total
porosity,
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n^C

(unitless)

ENTER
Stratum C
soil water-filled
porosity,
θ_w^C

7041428

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^\circ\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^\circ\text{K}$)	Critical temperature, T_c ($^\circ\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3\cdot\text{y}^{-1}$)	Reference conc, RfC (mg/m^3)
1.04E-01	9.90E-06	9.78E-04	25	7.643	356.65	561.00	1.74E+01	8.52E+03	2.6E-05	0.0E+00

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{sa} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{ra} (cm^2)	Stratum A 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, θ_a^{cz} (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_w^{cz} (cm^3/cm^3)	Floor-wall seam penmeter, X_{crack} (cm)
9 46E+08	1509	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.98E-10	17.05	0.43	0.136	0.294	3.844
Bldg ventilation rate, Q_{bldg} (cm^3/s)	Area of enclosed space below grade, A_g (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)	Stratum A effective diffusion coefficient, D_A^{eff} (cm^2/s)	Stratum B effective diffusion coefficient, D_B^{eff} (cm^2/s)	Stratum C effective diffusion coefficient, D_C^{eff} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D_T^{eff} (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9.24E+05	4.16E-04	15	8.457	6.27E-04	2.64E-02	1.77E-04	4.22E-03	1.09E-03	6.67E-04	7.62E-04	1.08E-03	1509
Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg, Q_{bldg} (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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3 \cdot \text{yr}^{-1}$)	Reference conc., RIC (mg/m ³)			
15	2.64E+01	0.10	6.67E-01	4.22E-03	3.84E+02	4.75E+02	5.90E-06	1.56E-04	2.6E-05	NA			

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
6.00E+02	NA	6.00E+02	8.52E+06	6.00E+02

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

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

Sol Properties Lookup Table									
SCS Sol Type	K_a (cm ³ /h)	α (1/cm)	N (unitless)	M (unitless)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092	0.0092	0.0092
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016	0.016	0.016
L	1.04	0.036	1.56	0.359	0.43	0.078	0.020	0.020	0.020
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040	0.040	0.040
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044	0.044	0.044
SC	0.12	0.027	1.23	0.187	0.38	0.100	0.025	0.025	0.025
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.029	0.029	0.029
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046	0.0046	0.0046
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039	0.0039	0.0039
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056	0.0056	0.0056
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011	0.011	0.011
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030	0.030	0.030

Chemical Properties Lookup Table													
CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant at reference temperature, H' (unitless)	Henry's law constant at reference temperature, H (atm-cm ³ /mol)	Henry's reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (μ g/m ³) ⁻¹	Reference conc., Rtc (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benzo(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E-03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-04	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzoic Acid	6.00E-01	5.38E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E+01
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Bulanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	5.96E-03	25	353.24	562.16	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.96E-03	25	390.88	563.05	10,346	0.0E+00	3.5E-01
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.05E-01	1.72E-02	25	347.24	545.00	7,342	8.3E-06	0.0E+00
72208	Endrin	1.23E+04	1.26E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	4.00E-06	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	636.44	860.38	13,000	9.7E-05	0.0E+00
74639	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.58E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	259.25	432.00	5,714	0.0E+00	5.0E-03
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.19E-03	25	319.00	510.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	2.19E-02	5.34E-04	25	422.35	552.00	6,391	0.0E+00	7.0E-01
75252	Bromofom	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	5.34E-04	25	422.35	552.00	6,391	0.0E+00	7.0E-01
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.58E-02	5.61E-03	25	363.15	585.85	7,000	1.8E-05	0.0E+00
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.61E-02	25	304.75	576.05	6,247	5.0E-05	0.0E+00
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	4.47E-02	1.09E-03	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.78E-06	1.20E+04	7.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.19E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	386.15	602.00	8,322	1.8E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E+01

7041432

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	14 751	0 0E+00	3 5E+01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+06	5 17E-05	1 26E-06	13 000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	890 45	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	6 35E-02	7 86E-06	1 98E+00	2 61E-03	6 37E-05	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	6 20E-07	1 53E-08	1 53E-08	13 977	5 7E-06	0 0E+00
87583 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	7 48E-06	738 00	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 98E+03	1 00E-06	8 15E-03	10 206	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	14 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	12 000	0 0E+00	0 0E+00
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 84E-07	4 00E-09	10 373	0 0E+00	1 4E-01
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	13 000	1 3E-04	0 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	8 661	0 0E+00	7 0E+00
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	10 800	0 0E+00	1 8E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	9 700	0 0E+00	2 0E-01
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	9 572	0 0E+00	1 8E-02
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	13 000	0 0E+00	3 5E-01
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	10 566	0 0E+00	2 0E-03
100425 Styrene	7 78E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	8 501	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	6 69E-06	7 87E+03	8 20E-05	2 00E-06	8 737	0 0E+00	1 0E+00
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	11 329	0 0E+00	7 0E-02
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	8 525	0 0E+00	7 0E+00
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	9 271	0 0E+00	8 0E-01
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	11 689	0 0E+00	1 4E-02
108064 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	7 643	2 8E-05	0 0E+00
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	7 800	0 0E+00	2 0E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 28E+02	2 72E-01	6 63E-03	8 523	0 0E+00	7 0E+00
108907 Chlorobenzene	2 19E+02	7 30E-02	8 10E-06	4 72E+02	1 52E-01	3 98E-07	7 930	0 0E+00	4 0E-01
108962 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 71E-03	8 410	0 0E+00	2 0E-02
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	10 920	0 0E+00	2 1E+00
115287 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	13 121	0 0E+00	2 0E-01
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	10 471	0 0E+00	2 0E-01
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	11 000	0 0E+00	1 1E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	13 467	1 9E-04	0 0E+00
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	8 000	2 4E-05	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	8 288	5 8E-07	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	14 370	0 0E+00	1 1E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	7 192	0 0E+00	3 5E-02
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 87E-01	4 07E-03	6 717	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	17 000	2 1E-04	0 0E+00
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	2 26E-02	5 56E-06	2 20E-05	6 56E-05	1 60E-06	15 000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	13 815	0 0E+00	1 4E-01
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	16 455	2 1E-05	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	16 000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	10 197	0 0E+00	1 4E-01
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	9 790	0 0E+00	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	13 000	4 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	13 000	4 8E-03	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 40E-01	3 05E-05	7 44E-07	13 000	5 3E-04	0 0E+00
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	7 26E-01	1 77E-02	7 000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	12 938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	11 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	2 00E-01	4 67E-01	9 51E-06	13 000	2 6E-03	0 0E+00
8001362 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	1 14E-02	14 127	0 0E+00	3 0E-04
11098825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	5 62E-02	2 46E-04	6 00E-06	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	8 00E-02	1 89E-01	4 60E-03	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	5 70E-02	8 20E-02	2 00E-03	19 000	1 0E-04	0 0E+00
53469218 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	4 20E-01	1 19E-02	2 90E-04	18 000	1 0E-04	0 0E+00
				3 40E-01	2 13E-02	5 20E-04	18 000	1 0E-04	0 0E+00

7041434

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant reference temperature, T_R ($^{\circ}\text{C}$)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_b ($^{\circ}\text{K}$)	Critical temperature, T_c ($^{\circ}\text{K}$)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ¹	Reference conc., RIC (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	2.3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	9.48E+08	2057.64	0.230	0.150	0.130	0.419	9.36E-10	0.746	6.88E-10	17.05	0.43	0.136	0.294	3.844
			Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{we} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative permeability, k_{rp} (cm^2)	Stratum A effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_c (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)
Bldg ventilation rate, Q_{ventg} (cm^3/s)			Area of enclosed space below grade, A_g (cm^2)	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} ($\text{atm}\cdot\text{m}^3/\text{mol}$)	Henry's law constant at ave. groundwater temperature, H'_{ts} (unitless)	Vapor viscosity at ave. soil temperature, μ_{ts} (g/cm-s)	Stratum A effective diffusion coefficient, D_{eff}^A (cm^2/s)	Stratum B effective diffusion coefficient, D_{eff}^B (cm^2/s)	Stratum C effective diffusion coefficient, D_{eff}^C (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)	Diffusion path length, L_d (cm)
	5.83E+04	9.24E+05	4.16E-04	15	7.492	2.47E-03	1.04E-01	1.77E-04	4.22E-03	1.07E-03	6.40E-04	7.36E-04	9.74E-04	2057.64
Convection path length, L_p (cm)			Source vapor conc., C_{source} ($\mu\text{g}/\text{m}^3$)	Average vapor flow rate into bldg, Q_{vld} (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_{bldg} ($\mu\text{g}/\text{m}^3$)	Unit risk factor, URF ($\mu\text{g}/\text{m}^3$) ⁻¹	Reference conc., RIC (mg/m ³)			
	15	1.04E+02	0.10	6.67E-01	4.22E-03	3.84E+02	4.80E+02	4.69E-06	4.88E-04	2.3E-05	NA			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION 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)
2.17E+02	NA	2.17E+02	7.92E+06	2.17E+02

ERROR SUMMARY BELOW

(DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS

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

VLOOKUP TABLES

SCS Sol Type	K_1 (cm/h)	α (1/cm)	N (unitless)	M (unitless)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RLC (mg/m ³)
C	0.20	0.008	1.09	0.083	0.38	0.068	0.0092								
CL	0.26	0.019	1.31	0.237	0.41	0.095	0.016								
L	1.04	0.036	1.56	0.359	0.43	0.078	0.040								
LS	14.59	0.124	2.28	0.561	0.41	0.057	0.040								
S	29.70	0.145	2.68	0.627	0.43	0.045	0.044								
SC	0.12	0.027	1.23	0.187	0.38	0.025	0.025								
SCL	1.31	0.059	1.48	0.324	0.39	0.100	0.028								
SI	0.25	0.016	1.37	0.270	0.46	0.034	0.0046								
SIC	0.02	0.005	1.09	0.083	0.26	0.070	0.0039								
SICL	0.07	0.010	1.23	0.187	0.43	0.089	0.0056								
SIL	0.45	0.020	1.41	0.291	0.45	0.067	0.011								
SL	4.42	0.075	1.89	0.471	0.41	0.065	0.030								

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm ³ /g)	Diffusivity in air, D_a (cm ² /s)	Diffusivity in water, D_w (cm ² /s)	Pure component water solubility, S (mg/L)	Henry's law constant, H' (unitless)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m ³) ⁻¹	Reference conc., RLC (mg/m ³)
50293	DDT	2.63E+06	1.37E-02	4.95E-06	2.50E-02	3.32E-04	8.10E-06	25	533.15	720.75	11,000	9.7E-05	0.0E+00
50328	Benz(a)pyrene	1.02E+06	4.30E-02	9.00E-06	1.62E-03	4.63E-05	1.13E-06	25	715.90	969.27	15,000	2.1E-03	0.0E+00
51285	2,4-Dinitrophenol	1.00E-02	2.73E-02	9.06E-06	2.79E+03	1.82E-05	4.44E-07	25	605.28	827.85	15,000	0.0E+00	7.0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2.02E-02	5.18E-06	2.49E-03	6.03E-07	1.47E-08	25	743.24	990.41	16,000	2.1E-03	0.0E+00
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.25E+00	3.05E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00
56553	Benz(a)anthracene	3.98E+05	5.10E-02	9.00E-06	9.40E-03	1.37E-04	3.34E-06	25	708.15	1004.79	15,000	2.1E-04	0.0E+00
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	13,000	3.7E-04	0.0E+00
58999	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	6.80E+00	5.74E-03	1.40E-05	25	596.55	839.36	13,000	3.7E-04	0.0E+00
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	13,000	4.6E-03	0.0E+00
65850	Benzic Acid	6.00E-01	5.36E-02	7.97E-06	3.50E+03	6.31E-05	1.54E-06	25	720.00	751.00	10,000	0.0E+00	1.4E-01
67841	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.88E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00
67721	Hexachloroethane	1.78E+03	2.50E-02	6.80E-06	5.00E+01	3.61E-04	8.80E-06	25	458.00	695.00	9,510	4.0E-06	0.0E+00
71363	Butanol	6.92E+00	8.00E-02	9.30E-06	7.40E+04	3.61E-04	8.80E-06	25	390.88	583.05	10,346	0.0E+00	3.5E-01
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.75E+03	2.28E-01	5.56E-03	25	353.24	562.16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	2.28E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	1.0E+00
72208	Endrin	1.23E+04	1.25E-02	4.74E-06	2.50E-01	3.08E-04	7.51E-06	25	718.15	986.20	12,000	0.0E+00	1.1E-03
72435	Methoxychlor	9.77E+04	1.56E-02	4.48E-06	4.50E-02	6.48E-04	1.58E-05	25	651.02	848.49	14,000	0.0E+00	1.8E-02
72548	DDD	1.00E+06	1.69E-02	4.76E-06	9.00E-02	1.64E-04	2.10E-05	25	639.90	863.77	14,000	6.9E-05	0.0E+00
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.61E-04	2.10E-05	25	639.44	860.38	13,000	9.7E-05	0.0E+00
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.56E-01	6.24E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-06	2.76E+03	1.11E+00	2.71E-02	25	313.00	510.00	5,250	8.4E-05	0.0E+00
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	3.02E-02	25	313.00	552.00	6,706	4.7E-07	3.0E+00
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.00E+03	2.19E-02	5.34E-04	25	422.35	596.00	6,391	0.0E+00	7.0E-01
75252	Bromochloromethane	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.19E-02	1.60E-03	25	313.00	552.00	6,391	0.0E+00	7.0E-01
75343	1,1-Dichloroethane	5.50E+01	2.88E-02	1.06E-05	6.74E+03	6.56E-02	1.60E-03	25	330.55	585.85	7,000	1.8E-05	0.0E+00
75354	1,1,2-Trichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01
7589E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	4.47E-02	1.09E-03	2.61E-02	25	304.75	578.05	6,247	5.0E-05	0.0E+00
76448	Hepachlor	1.41E+06	1.12E-02	5.89E-06	1.80E-01	4.47E-02	2.71E-02	25	603.69	846.31	13,000	1.3E-03	0.0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.11E+00	2.71E-02	25	512.15	746.00	10,931	0.0E+00	7.0E-05
78591	Isophorone	4.68E+01	6.23E-02	6.76E-06	1.20E+04	2.72E-04	6.63E-06	25	488.35	715.00	10,271	2.7E-07	0.0E+00
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.80E-03	25	369.52	572.00	7,590	0.0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.74E-02	9.12E-04	25	369.15	602.00	8,322	1.6E-05	0.0E+00
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.10E+03	4.22E-01	1.03E-02	25	360.36	544.20	7,505	1.7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.97E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	0.0E+00
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	4.24E+00	6.36E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 88E-06	1 12E+01	3 85E-08	9 39E-10	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 68E+00	5 17E-05	1 26E-06	560 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	486 15	738 00	10,206	2 2E-05	0 0E+00
87665 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 79E-06	319 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-08	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 48E-06	2 20E+04	1 60E-02	3 90E-04	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 08E+03	9 84E-04	2 40E-05	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	1 69E-06	1 69E+02	3 23E-01	7 88E-03	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	356 65	561 00	7,643	2 8E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	404 87	632 40	8,410	0 0E+00	2 1E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	1 63E+05	1 63E-05	3 98E-07	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 88E-05	704 09	882 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 98E-02	1 03E-05	2 60E+03	3 21E-02	7 83E-04	418 14	618 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	394 40	620 20	8,288	5 9E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	333 65	544 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	320 85	516 50	7,192	0 0E+00	7 0E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	320 85	516 50	7,192	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 68E-06	2 20E-05	6 58E-05	1 60E-06	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 58E-06	1 50E-03	4 58E-03	1 11E-04	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 58E-06	8 00E-04	3 40E-05	8 29E-07	753 15	1019 70	16,455	2 1E-06	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	714 15	979 00	16,000	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	803 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	3 06E-05	3 06E-05	7 46E-07	568 00	770 00	12,938	1 0E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	509 60	748 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	613 96	848 76	13,000	2 8E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	1 14E-02	629 88	1750 00	14,127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	6 00E-06	657 15	873 31	14,000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 80E-03	402 50	539 37	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 25E-02	5 42E-06	4 20E-02	1 19E-02	2 90E-04	377 50	512 27	19,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	340 50	475 22	18,000	1 0E-04	0 0E+00

TAB

Appendix H

APPENDIX H

Supporting Information for Exposure Factors Development

TABLE H-1
Exposure Factors for Soil
Memphis Depot Duro Field RI

Symbols	Parameter	FUTURE					
		Maintenance Worker	Utility Worker	Industrial Worker	Onsite Residential or Recreational Adult	Onsite Residential or Recreational Child	Onsite Recreational Youth
BW	Body Weight (kg)	70	70	70	70	15	45
IR _{inh}	Inhalation Rate (m ³ /day)	20	20	20	20	15	20
IR _{inh,adj}	Inhalation Rate, age-adjusted	N/A	N/A	N/A	12.86	N/A	N/A
AT _C	Averaging Time - Carcinogenic	70x365	70x365	70x365	70x365	N/A	70x365
AT _{NC}	Averaging Time - Noncarcinogenic	25x365	25x365	25x365	30x365	6x365	10x365
Soils							
IR _{ing}	Incidental Ingestion Rate (mg/day)	50	100	50	100	200	100
IR _{adj,ing}	Age-adjusted Incidental Ingestion Rate (mg/day)	N/A	N/A	N/A	114.29	N/A	N/A
FI	Fraction Ingested	0.5	0.5	1	1	1	1
SA	Skin Surface Area (cm ²)	2,679	2,679	2,679	5,049	2,351	4,478
SA _{adj}	Age-adjusted Skin Surface Area (cm ²)	N/A	N/A	N/A	2,671	N/A	N/A
AF	Adherence Factor for dry soil (mg/cm ²)	0.03	0.1	0.03	0.03	0.15	0.15
PEF	Particulate Emission Factor (m ³ /kg)	1.32E+09	1.32E+09	1.32E+09	1.32E+09	1.32E+09	1.32E+09
ET	Exposure Time (hours/day)	8	8	8	4	4	4
EF	Exposure Frequency (days/year)	50	24	250	350, 45	350, 45	45
ED	Exposure Duration (years)	25	25	25	30	30	10
Notes							
a	All current scenario exposure factors are subject to re-evaluation based on site-specific information						
b	Default exposure factors adopted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 c-03 March 25, 1991						
c	Ingestion rates adopted from EPA Supplemental Guidance to RAGS Region 4 Bulletin, Human Health Risk Assessment, Interim, November 1995						
d	Fraction ingested assumed by the nature of the activity						
e	Worker soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix G)						
f	Residential/recreational adult soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands, forearms & lower legs (see Appendix G)						
g	Residential/recreational child soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands, forearms, lower legs & feet (see Appendix G)						
h	Recreational youth soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands, forearms, lower legs & feet (see Appendix G)						
i	0.03 = Groundkeeper No.2 (exposure scenarios similar to urban horticulture center, campus grounds, arboretum) AFs chosen from Soil Loading calculations (see Appendix G)						
j	0.1 = Construction Worker (heavy digging, exposure to mixed bare earth, concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)						
k	0.15 = Daycare Kids No 15 (indoor exposure to linoleum, outdoor exposure to grass, bare earth, no shoes) AFs chosen from Soil Loading calculations (see Appendix G)						
l	PEF adopted from EPA 1996, Soil Screening Guidance Technical Background Document						
m	4 hours soil exposure are assumed for residential dermal contact and inhalation exposure time						
n	Worker soil exposure is assumed to be once a week per year, minus vacation time						
o	Worker soil exposure is assumed to be twice a month						
p	Age-adjusted inhalation rate for residential adult						
q	Age-adjusted dermal contact for residential adult						
cm ²	centimeters squared						
days/year	days per year						
hours/day	hours per day						
kg	kilograms						
m ³ /day	cubic meters per day						
m ³ /kg	cubic meters per kilogram						
mg/cm ²	milligrams per centimeter squared						
mg/day	milligrams per day						
N/A	Not applicable for this receptor						

TABLE H-2
Exposure Factors for Sediment and Surface Water
Memphis Depot Dunn Field RI

		FUTURE				
Symbols	Parameter	Maintenance Worker ditches	Industrial Worker ditches	Onsite Recreational Adult	Onsite Recreational Child	Onsite Recreational Youth
BW	Body Weight (kg)	70	a	70	a	a
IR Inh	Inhalation Rate (m ³ /day)	20	a	20	a	a
AT C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365
AT NC	Averaging Time - Noncarcinogenic	25x365	a	30x365	a	10x365
Surface Water						
IR Ing w	Incidental Ingestion - Wading (L/hour)	0.01	b	0.01	b	0.01
SA w	Skin Surface Area - Wading (cm ²)	2,679	c	5,671	d	e
ET	Exposure Time (hours/day)	2	g	2	g	2
EF	Exposure Frequency (days/year)	12	h	45	j	45
ED	Exposure Duration (years)	25	a	30	a	10
Sediments						
IR Ing	Incidental Ingestion - Wading (mg/day)	50	k	100	k	k
FI	Fraction Ingested	1	i	1	i	i
SA	Skin Surface Area - Wading (cm ²)	2,679	c	5,671	d	e
AF	Adherence Factor for wet soil (mg/cm ²)	0.1	m	0.1	m	0.1
ET	Exposure Time (hours/day)	2	g	2	g	2
EF	Exposure Frequency (days/year)	12	h	45	j	45
ED	Exposure Duration (years)	25	a	30	a	10

Notes:

a All current scenario exposure factors are subject to re-evaluation based on site-specific information

b Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

c Surface water ingestion while wading adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

d Worker surface water/sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix c)

e Recreational adult sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix d)

f Recreational youth sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix e)

g Recreational child sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix f)

h 2 hours exposure to drainage ditch sediment/surface water is assumed for workers/recreational visitors based on the nature of the activities

i Maintenance Worker surface water/sediment exposure is assumed to be once a month

j Industrial Worker surface water & sediment exposure (sump, ditch or impoundment) is assumed to be once a week

k Recreational factors adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

l Sediment ingestion rates adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

m Fraction ingested assumed by the nature of the activity

n 0.1 = Construction Worker (heavy digging, exposure to mixed bare earth, concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)

cm² centimeters squared

days/year days per year

hours/day hours per day

kg kilograms

L/hour liters per hour

m³/day cubic meters per day

m²/kg cubic meters per kilogram

mg/cm² milligrams per centimeters squared

mg/day milligrams per day

N/A Not applicable for this receptor

TABLE H-3
Exposure Factors for Groundwater
Memphis Depot Dunn Field RI

Symbols	Parameter	FUTURE			
		Industrial Worker	Onsite Resident (Adult)	Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	15	a
IR _{Inh}	Inhalation Rate (m ³ /day)	*	*	*	*
AT _C	Averaging Time - Carcinogenic	70x365	a	N/A	a
AT _{NC}	Averaging Time - Noncarcinogenic	25x365	a	6x365	a
Groundwater					
IR _{Ing}	Ingestion Rate of Water (L/day)	1	a	1	a
IR _{adj. Ing}	Age-adjusted Incidental Ingestion Rate (L/day)	N/A	1.1	N/A	a,f
SA	Skin Surface Area (cm ²)	2679	b	6,557	d
SA _{adj}	Age-adjusted Skin Surface Area (cm ²)	N/A	9480	N/A	c,g
ET	Exposure Time (hours/day)	0.007	e	0.007	e
EF	Exposure Frequency (days/year)	250	a	350	a
ED	Exposure Duration (years)	25	a	6	a

Notes:

- * Inhalation exposures to volatiles in the groundwater are equal to the ingestion exposures as per EPA Region IV policy
- a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
- b Worker groundwater exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms. (see Appendix G)
- c Residential adult total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)
- d Residential child total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)
- e Calculation for Shower dermal exposure time 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 event/day
- f Age-adjusted ingestion rate for residential adult.
$$IR_{adj} = \frac{IR_c \times ED_c}{BWC} + \frac{IR_a \times (EDA - ED_c)}{BWA}$$

$$= \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70} = 1.1 \text{ (L-year)/(kg-day)}$$
- g Age-adjusted dermal contact for residential adult.
$$SA_{adj} = \frac{SA_c \times ED_c}{BWC} + \frac{SA_a \times (EDA - ED_c)}{BWA}$$

$$= \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70} = 9480 \text{ (cm}^2\text{-year)/(kg)}$$

cm² centimeters squared
days/year days per year
hours/day hours per day
kg kilograms
L/day liters per day
m³/day cubic meters per day
N/A Not applicable for this receptor

TABLE H-4
Surface Areas per Receptor
Memphis Depot Dunn Field RI

Surface Area Calculations for Adult Receptors

Surface Area for Residential Adults for soil exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet	
602.5	903.5	1805	1172.5	2370	5930	N/A	5049 1/2 head, hands, forearms, & lower legs

Surface Area for Adults Workers for soil & water exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet	
602.5	903.5	1805	1172.5	N/A	N/A	N/A	2679 1/2 head, hands & forearms

Surface Area for Recreational Adults for sediment (wading) exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet	
N/A	903.5	1805	1172.5	2370	5930	1225	5671 hands, forearms, lower legs & feet

Forearms = 45% whole Arms if not available

Lower legs = 40% entire Leg if not available

All values are averages of 50th percentile Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Tables 6.2 & 6.3)

Mean Total Body Surface Area (TBSA) for male/female adults =

20,000

TBSA is central tendency value for Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Table 6.14)

Surface Area Calculations for Child Receptors

Total Body Surface Area for Male-Female Children

50th percentile	Male	Female	
0-1	6030	5790	
1-2	6030	5790	
2-3	6030	5790	
3-4	6640	6490	
4-5	7310	7060	
5-6	7930	7790	Mean TBSA for Child 6557

All values are averages of 50th percentile Male-Female Children from EPA Exposure Factors Handbook, 1997 (Tables 6.6 & 6.7)

Percent of Total Body Surface Area for Male-Female Children by Body Part

Age	1/2 Head	Hands	Feet	Forearms	Lower legs	
0-1	18.2	5.3	6.54	13.7	20.6	
1-2	16.5	5.68	6.27	13	23.1	
2-3	14.2	5.3	7.07	11.8	23.2	
3-4	13.6	6.07	7.21	14.4	28.8	
4-5	13.8	5.7	7.29	14	27.8	
5-6						
Mean %	15	6	7	6	10	43 %
	500	368	451	395	637	2351 Percentage of TBSA for Child

Calculated Surface Area for Child for sediment (wading) exposure

368	451	395	637	28 %	1851 Percentage of TBSA for Child (sed exposure)
-----	-----	-----	-----	------	--

For comparison

	Arms (entire)	Legs (entire)
Mean %	13	24
	877	1593

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Table 6.8)

Forearms = 45% whole Arms if not available

Lower legs = 40% entire Leg if not available

(Surface areas for Youth receptors on next page)

7041445

TABLE H-4

Surface Areas per Receptor
Memphis Depot Dunn Field RI

Surface Area Calculations for Youth Receptors

Total Body Surface Area for Male-Female Youths

50th percentile	Male	Female
6>7	8660	8430
7>8	9360	9170
8>9	10000	10000
9>10	10700	10600
10>11	11800	11700
11>12	12300	13000
12>13	13400	14000
13>14	14700	14800
14>15	16100	15500
15>16	17000	15700
16>17	17600	16000
17>18	18000	16300

Mean TBSA for Youth **13118**

All values are averages of 50th percentile Male-Female Children from EPA Exposure Factors Handbook, 1997 (Tables 6.6 & 6.7)

Percent of Total Body Surface Area for Male-Female Youths by Body Part

Age	Head	Arms	Hands	Legs	Feet
6>7	13.1	13.1	4.71	27.1	6.9
9>10	12	12.3	5.3	28.7	7.58
12>13	8.74	34.7	5.39	30.5	7.03
13>14	9.97	32.7	5.11	32	8.02
16>17	7.96	32.7	5.68	33.6	6.93
17>18	7.58	31.7	5.13	30.8	7.28

Mean %	10	26	5	30	7
% TBSA	1298	3437	685	3994	956

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Table 6.8)

Calculated Surface Area for Youth for soil exposure

1/2 Head	Forearms	Hands	Lower legs	Feet	%
649	1547	685	1598	N/A	72 4478

Percentage of TBSA for Youth (soil)
1/2 head, hands, forearms & lower legs

Calculated Surface Area for Youth for sediment (wading) exposure

1/2 Head	Forearms	Hands	Lower legs	Feet	%
N/A	1547	685	1598	956	69 4785

Percentage of TBSA for Youth (sed)
hands, forearms, lower legs & feet

Forearms = 45% whole Arms if not available

Lower legs = 40% entire Leg if not available

TABLE H-5
Chemical-specific Dermal Permeability Factors
Memphis Depot Dunn Field RI

Chemical Name	Dermal Absorption		Permeability Constant	
		ABS		PC
1,1,2,2-Tetrachloroethane	1%	EPA Reg 4 1995	9 0E-03	EPA 1992
1,1,2-Trichloroethane	1%	EPA Reg 4 1995	N/A	
1,1-Dichloroethene	1%	EPA Reg 4 1995	N/A	
1,2-Dichloroethane	1%	EPA Reg 4 1995	5 3E-03	EPA 1992
2,4,6-Trichlorophenol	10%	EPA Reg 3 1995	5 0E-02	EPA 1992
2-Nitrophenol	N/A		1 0E-01	EPA 1992
Aluminum	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Antimony	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Arsenic	3%	Wester 1993	1 6E-04	EPA 1992
Barium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Benzo(a)anthracene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992
Benzo(a)pyrene	13%	EPA Reg 3 1995	1 2E+00	EPA 1992
Benzo(b)fluoranthene	10%	EPA Reg 3 1995	1 2E+00	EPA 1992
Benzo(k)fluoranthene	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Beryllium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Cadmium	1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Carbazole	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Carbon tetrachloride	1%	EPA Reg 4 1995	2 2E-02	EPA 1992
Chloroethane	1%	EPA Reg 4 1995	8 0E-03	EPA 1992
Chloroform	1%	EPA Reg 4 1995	1 3E-01	EPA 1992
Chloromethane	1%	EPA Reg 4 1995	4 2E-03	EPA 1992
Chromium, total	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Chrysene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992
Cobalt	0 1%	EPA Reg 4 1995	4 0E-04	EPA 1992
Copper	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Dibenz(a,h)anthracene	10%	EPA Reg 3 1995	2 7E+00	EPA 1992
Dieldrin	10%	Ryan 1987	1 6E-02	EPA 1992
Heptachlor epoxide	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Indeno(1,2,3-cd)pyrene	10%	EPA Reg 3 1995	1 9E+00	EPA 1992
Lead	0 1%	EPA Reg 4 1995	4 0E-06	EPA 1992
Manganese	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Mercury	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Methylene chloride	1%	EPA Reg 4 1995	4 5E-03	EPA 1992
Nickel	0 1%	EPA Reg 4 1995	1 0E-04	EPA 1992
Pentachlorophenol	24%	Wester 1993	6 5E-01	EPA 1992
Phenanthrene	1%	EPA Reg 4 1995	2 3E-01	EPA 1992
Silicon	N/A		1 6E-04	EPA 1992
Tetrachloroethene	1%	EPA Reg 4 1995	4 8E-02	EPA 1992
Thallium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Total 1,2-Dichloroethene	1%	EPA Reg 4 1995	1 0E-02	EPA 1992
Xylenes (total)	1%	EPA Reg 4 1995	8 0E-02	EPA 1992
Trichloroethene	1%	EPA Reg 4 1995	1 6E-02	EPA 1992
Vanadium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Vinyl chloride	1%	EPA Reg 4 1995	7 3E-03	EPA 1992

References

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2,4-dichlorophenoxyacetic acid from soil with respect to soil load and skin contact time In vivo absorption in Rhesus
monkey and in vitro absorption in human skin Journal of Toxicological and Environmental Health, Vol. 47, pp. 335-344
- N/A Not Available

* = Value for *m*-Xylene used for (total) Xylenes

TABLE H-6
Soil Loading Information
Memphis Depot Dunn Field RI

APost-Activity Dermal Soil Loadings (mg/cm ²)																
Activity	N	Hands			Arms			Legs			Faces			Feet		
		Geo	Mean	std dev	Geo	Mean	std dev	Geo.	Mean	std dev	Geo	Mean	std dev	Geo	Mean	std dev
Indoor:																
Tae Kwon Do	7		0 0063		1 9	0 0019		4.1	0 002		2			0 0022		2 1
Greenhouse Workers	2		0 043		-	0 0064		-	0 0015		-	0.005		-		
Indoor Kids No 1	4		0 0073		1 9	0 0042		1 9	0 0041		2 3			0 012		1 4
Indoor Kids No 2	6		0 014		1 5	0 0041		2	0 0031		1 5			0 0091		1 7
Daycare Kids No 1a	6		0.11		1.9	0 026		1 9	0.03		1 7			0 079		2 4
Daycare Kids No 1b	6		0.15		2 1	0 031		1 8	0 023		1.2			0 13		1 4
Daycare Kids No.2	5		0 073		1 6	0 023		1 4	0 011		1 4			0 044		1 3
Daycare Kids No 3	4		0 036		1 3	0 012		1 2	0 014		3			0 0053		5 1
Outdoor:																
Soccer No 1	8		0 11		1 8	0 011		2	0.031		3 8	0 012		1 5		
Soccer No 2	8		0 035		3 9	0 0043		2 2	0.014		5 3	0 016		1 5		
Soccer No 3	7		0 019		1.5	0 0029		2 2	0.0081		1 6	0 012		1 6		
Groundskeepers No.1	2		0 15		-	0 005		-				0.0021		-	0 018	-
Groundskeepers No 2	5		0 098		2 1	0 0021		2 6	0 001		1 5	0 01		2		
Groundskeepers No 3	7		0 03		2 3	0 0022		1 9	0 0009		1 8	0 0044		2.6	0 004	2 6
Groundskeepers No 4	7		0 045		1 9	0 014		1 8	0 0008		1.9	0 0026		1 6	0 018	1 5
Groundskeepers No 5	8		0.032		1 7	0 022		2 8	0 001		1 4	0 0039		2 1		
Landscape/Rockery	4		0 072		2 1	0 03		2 1				0 0057		1 9		
Irrigation Installers	6		0 19		1 6	0.018		3 2	0 0054		1 8	0 0063		1 3		
Gardeners No 1	8		0 2		1 9	0 05		2 1	0 072		1 4	0 058		1 6	0 17	1 6
Gardeners No 2	7		0 18		3 4	0.054		2.9	0 022		2	0 047		1 6	0 26	1 6
Rugby No 1	8		0 4		1 7	0 27		1 6	0 36		1 7	0 059		2 7		
Rugby No.2	8		0 14		1 4	0 11		1 6	0 15		1 6	0 046		1 4		
Rugby No.3	7		0 049		1 7	0 031		1 3	0 057		1 2	0 02		1 5		
Archeologists	7		0 14		1 3	0 041		1 9	0 028		4 1	0 05		1 8	0 24	1 4
Construction Workers	8		0 24		1 5	0 098		1 5	0 066		1 4	0 029		1 6		
Utility Workers No 1	5		0 32		1 7	0 2		2 7				0 1		1 5		
Utility Workers No 2	6		0 27		2 1	0 3		1 8				0 1		1.5		
Equipment Operators No 1	4		0 26		2 5	0 089		1 6				0 1		1 4		
Equipment Operators No 2	4		0 32		1 6	0 27		1.4				0.223		1 7		
Farmers No 1	4		0 41		1 6	0 059		3.2	0 0058		2.7	0 018		1 4		
Farmers No 2	6		0 47		1.4	0 13		2.2	0 037		3 9	0 041		3		
Reed Gatherers	4		0 66		1 8	0 036		2.1	0.16		9 2			0 63		7 1
Kids-in-mud No 1	6		35		2 3	11		6.1	36		2			24		3 6
Kids-in-mud No 2	6		58		2 3	11		3 8	9 5		2 3			6.7		12 4

= substituted information

N = Number of subjects

Sources.

Kissel et al , 1996b, Holmes et al , 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6.12)

TABLE H-7
Soil Loading Information
Memphis Depot Data Field #2

B. Calculation of UCL90 for Soil Loading of Body Parts													
Activity	N	Hands	Hands	Hands SL	Arms	Arms	Arms SL	Legs	Legs	Legs SL	Faces	Faces	Feet SL
		H ₉₅	In(Geom mean)	UCL90	H ₉₅	In(Geom mean)	UCL90	H ₉₅	In(Geom mean)	UCL90	H ₉₅	In(Geom mean)	Feet
			In(sd)									In(sd)	UCL90
Indoor:													
Tae Kwon Do	7	1 9020	-5.0672	0.64	0.0127	3.1435	-5.2659	1.41	0.0314	1.9700	-5.2146	0.69	0.0044
Greenhouse Workers	2		-3.1466				-5.0515				-5.2963		
Indoor Kids No 1	4	3 0115	-4.9199	0.64	0.0274	3.0115	-5.4727	0.64	0.0158	3.6225	-5.4968	0.83	0.0331
Indoor Kids No 2	6	1 6810	-4.2687	0.41	0.0206	2.1270	-5.4968	0.69	0.0101	1.68	-5.7764	0.41	0.0046
Daycare Kids No 1a	6	2 0430	-2.2073	0.64	0.2430	2.0430	-3.4967	0.64	0.0574	1.8095	-3.5066	0.53	0.0531
Daycare Kids No 1b	6	2 2190	-1.8971	0.74	0.4125	1.8990	-3.4738	0.59	0.0617	1.4820	-3.7723	0.18	0.0284
Daycare Kids No 2	5	1 9070	-2.6173	0.47	0.1276	1.6910	-3.7723	0.34	0.0323	1.691	-4.5099	0.34	0.0155
Daycare Kids No 3	4	1 7975	-3.3242	0.26	0.0489	1.7035	-4.4228	0.18	0.0146	5.0045	-4.2687	1.10	0.6120
Outdoor:													
Soccer No 1	8	2 096	-2.2073	0.59	0.2083	2.2514	-4.5099	0.69	0.0252	3.5926	-3.4738	1.34	0.4631
Soccer No 2	8	3 5926	-3.3524	1.36	0.5609	2.4217	-5.491	0.79	0.0121	4.1486	-4.2687	1.67	0.7687
Soccer No 3	7	1 6070	-3.9633	0.41	0.0269	2.1190	-5.8430	0.79	0.0078	1.71	-4.4228	0.47	0.0186
Groundskeepers No.1	2		-1.8971				-5.2963						
Groundskeepers No 2	5	2 3935	-2.3228	0.74	0.3136	2.9800	-6.1658	0.96	0.0138	1.7550	-6.9078	0.41	0.0015
Groundskeepers No 3	7	2 1190	-3.5066	0.83	0.0872	1.9020	-6.1193	0.64	0.0044	1.834	-7.0131	0.59	0.0017
Groundskeepers No 4	7	1 9020	-3.1011	0.64	0.0910	1.8340	-4.2687	0.59	0.0258	1.902	-7.1309	0.64	0.0016
Groundskeepers No 5	8	1 9566	-3.4420	0.53	0.0545	2.8	-3.8167	1.03	0.1111	1.7852	-6.9078	0.34	0.0013
Landscaper/Rockery	4	3 4163	-2.6311	0.74	0.4096	3.4163	-3.5066	0.74	0.1707				
Irrigation Installers	6	1 8095	-1.6807	0.47	0.3104	2.9878	-4.0174	1.16	0.1675	1.9590	-5.2214	0.59	0.0107
Gardeners No 1	8	2 1737	-1.6094	0.64	0.4164	2.3668	-2.9957	0.74	0.1268	1.7852	-2.6311	0.34	0.0956
Gardeners No 2	7	2 9040	-1.7148	1.22	1.6240	2.4500	-2.9188	1.06	0.2761	1.9700	-3.8167	0.69	0.0488
Rugby No 1	8	1 9566	-0.9163	0.53	0.6817	1.9566	-1.3093	0.47	0.4269	1.9566	-1.0217	0.53	0.6136
Rugby No 2	8	1 7852	-1.9661	0.34	0.1859	1.9566	-2.2073	0.47	0.1739	1.9566	-1.8971	0.47	0.2371
Rugby No 3	7	1 7120	-3.0158	0.53	0.0817	1.4795	-3.4738	0.26	0.0378	1.4420	-2.8647	0.18	0.0645
Archaeologists	7	1 4795	-1.9661	0.26	0.1696	1.9020	-3.1942	0.64	0.0829	3.1435	-3.5756	1.41	0.4633
Construction Workers	8	1 8366	-1.4271	0.41	0.3453	1.8366	-2.3228	0.41	0.1410	1.7852	-2.7181	0.34	0.0876
Utility Workers No 1	5	1 9070	-1.1394	0.53	0.6110	2.9800	-1.6094	0.99	1.4388				
Utility Workers No 2	6	2 2190	-1.3083	0.74	0.7424	1.9590	-1.2040	0.59	0.5967				
Equipment Operators No 1	4	2 4485	-1.1394	0.47	0.6945	2.4485	-2.4191	0.47	0.1932				
Equipment Operators No 2	4	2 4485	-0.8916	0.47	0.8888	5.0045	-2.8302	1.16	0.4226				
Farmers No 1	4	2 4485	-0.8916	0.47	0.8888	5.0045	-2.8302	1.16	0.4226				
Farmers No 2	6	1 6265	-0.7550	0.34	0.6353	2.3110	-2.0402	0.79	0.4007	3.5450	-3.2968	1.36	0.8081
Reed Gatherers	4	2 8130	-0.4155	0.59	2	3.4163	-3.3242	0.74	0.2048	9.8920	-1.8326	2.22	599620
Kids-in-mud No 1	6	2 3110	3.5553	0.83	117	4.105	2.3979	1.81	1.997	2.1270	3.5835	0.69	89
Kids-in-mud No 2	6	2 3110	4.0604	0.83	194	3.5430	2.3979	1.34	223	2.3110	2.2513	0.83	32
Missing information													
Sources													
Kissel et al., 1996b, Holmes et al., 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6.12)													
H ₉₅ values adapted from R O Gilbert, 1987, Statistical Methods for Environmental Pollution Monitoring (Table A.10)													

TABLE H-4
Soil Loading Information
Memphis Depot Drain Field R1

C Calculation of Adherence Factors for Child Receptors																		
Activity	N	Hands	Hands SL	Hands	Arms	Arms SL	Arms vs Forearms	Legs	Legs SL	Legs vs	Lower legs	Faces	Faces SL	Faces	Feet	Feet SL	Feet	Final AF
		H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90	SA	SL*SA	Final AF
Indoor																		
Indoor Kids No 1	4	3.0115	0.0274	368	10	3.0115	0.0158	877	395	6	3.8225	0.0331	1593	21	2.01475	0.0188	451	8
Indoor Kids No 2	6	1.6810	0.0206	368	8	2.1270	0.0101	877	395	4	1.68	0.0346	1593	3	1.8085	0.0181	451	7
Daycare Kids No 1a	6	2.0430	0.0230	368	89	2.0430	0.0574	877	395	23	1.8095	0.0531	1593	34	2.5080	0.0394	451	140
Daycare Kids No 1b	6	2.2190	0.04125	368	152	1.8590	0.0617	877	395	24	1.4820	0.0284	1593	637	1.63	0.1757	451	79
Daycare Kids No 2	5	1.9070	0.01276	368	47	1.8810	0.0323	877	395	13	1.691	0.0155	1593	637	1.5745	0.0560	451	25
Daycare Kids No 3	4	1.7875	0.0489	368	18	1.7035	0.0146	877	395	6	5.0045	0.0120	1593	390	7.1683	17	451	8055
Outdoor																		
Soccer No 1	6	2.096	0.1192	368	44	2.2514	0.0127	877	395	5	3.5928	0.4631	1593	285	1.8966	0.0173	561	9
Soccer No 2	6	3.5928	0.1938	368	71	2.4217	0.0054	877	395	2	4.1486	0.7887	1593	490	1.8366	0.0230	501	12
Soccer No 3	7	1.6070	0.0194	368	7	2.1190	0.0085	877	395	1	1.71	0.0126	1593	8	1.71	0.0186	501	26

TABLE H-8
Soil Loading Information
Memphis Depot Drain Field R1

D. Calculation of Adherence Factors for Adult Receptors																					
Activity	N	Hands		Hands SL/Hands		Arms		Arms SL/Arms vs Forearms		Legs		Legs SL/Legs vs Lower legs		Faces		Faces SL		Feet		x=Final SA*SL (all)	Final AF
		H ₉₉	SA	UCL90	SL*SA	H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90	SA	SL*SA	H ₉₉	UCL90		
Outdoor																					
Groundkeepers No 2	5	2 3935	904	113	2 9800	0 0040	1805	1173	5	1 7550	0 0015	5830	2370	4	2 2840	0 0281	603	17	138	0 027	
Groundkeepers No 3	7	2 1180	904	35	1 9020	0 0024	1805	1173	3	1 834	0 0017	5930	2370	4	2 45	0 0181	603	11	73	0 012	
Groundkeepers No 4	7	1 9020	904	45	1 8340	0 0161	1805	1173	18	1 802	0 0016	5930	2370	4	1 71	0 0040	603	2	100	0 016	
Groundkeepers No 5	8	1 6586	904	31	2 8	0 0392	1805	1173	48	1 7852	0 0013	5830	2370	3	2 368	0 0099	603	6	86	0 017	
Gardeners No. 1	8	2 1737	904	201	2 3366	0 0599	1805	1173	70	1 7852	0 0058	5930	2370	227	1 9588	0 0617	603	55	19588	0 14	
Gardeners No. 2	7	2 9040	904	482	2 4500	0 0988	1805	1173	116	1 9700	0 0488	5930	2370	118	1 71	0 0729	603	44	1 712	0 20	
Construction Workers	8	1 8368	904	222	1 8368	0 1003	1805	1173	118	1 7852	0 0076	5930	2370	208	1 8588	0 0458	603	28	1251	0 11	
Utility Workers No 1	5	1 8070	904	310	2 9800	0 4150	1805	1173	487	1 755	0 1550	603	93	1 68	0 1473	603	89	890	0 33	0 29	
Utility Workers No 2	6	2 2180	904	299	1 8590	0 3279	1805	1173	384	1 68	0 1473	603	89	1 68	0 1473	603	89	772	772	0 29	

missing information was assumed

Smearing information was estimated.

TAB

Appendix I

APPENDIX I

Supplementary Toxicity Material

Appendix I
TOXICOLOGICAL PROFILES FOR COPCs AT DUNN FIELD

ANTIMONY

Antimony is a silvery white metal of medium hardness that breaks easily. Antimony is used as a component of lead and zinc alloys which are used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, type metal, ammunition and pewter. Exposure to antimony may occur through the ingestion of food or water, via breathing of air or through contact with soil, water or other substances that contain antimony. Skin contact and inhalation are common occupational exposures. A small amount of ingested antimony is absorbed into the bloodstream after a few hours. An unknown amount of inhaled antimony is absorbed through the lungs within a few days. Most of the absorbed antimony is transported to the liver, lungs, intestines and spleen. Within several weeks, antimony is excreted in the feces and urine (ATSDR, 1990).

Acute symptoms of antimony exposure include, diarrhea, vomiting, gastric discomfort and ulcers following oral ingestion of large quantities (< 19 ppm). Animal studies indicate that acute exposures may result in lung, heart, liver and kidney damage, eye irritation following inhalation of antimony, and skin irritation following dermal contact. Subchronic exposure to antimony via inhalation leads to heart problems, stomach ulcers, pneumoconiosis and eye and skin irritation. Animal studies indicate that subchronic ingestion of antimony may cause diarrhea, weight loss, liver damage and decreased red blood cell count (ATSDR, 1990).

Antimony in the atmosphere is in the form of particulate matter or adsorbed to particulate matter. Transport to land and surface water occurs through gravitational settling and other forms of dry and wet deposition. The fate of antimony in the environment is complicated because it can exist in two oxidation states, $3+$ and $5+$. In the aquatic environment, antimony is mainly associated with particulate matter and tends to settle out in areas of active sedimentation. Some forms of antimony are strongly sorbed to soil, making it relatively immobile. Antimony may also adsorb strongly to colloidal materials in soil which may become mobilized and transported to groundwater. In general, adsorption is greatest at near neutral pHs. Antimony does not appear to bioconcentrate in fish and aquatic organisms (ATSDR, 1990).

ARSENIC

Arsenic is a naturally occurring element and enters the environment as a result of natural forces (volcanoes, weathering) and human activities such as metal smelting, glass manufacturing, pesticide production and application, and fossil-fuel burning (ATSDR, 1991). In general, inorganic arsenic is more toxic than organic arsenic. The most common exposure route is ingestion of arsenic in food or water. Inhalation and skin contact are secondary routes of exposure. Arsenic is quickly absorbed through the lungs or digestive tract into the bloodstream. Within a few hours most of the absorbed arsenic is cleared from the blood and is excreted in the urine (ATSDR, 1991).

Large doses of ingested inorganic arsenic (20 mg/kg or greater) induce death while smaller doses produce systemic effects such as irritation of the digestive tract, nausea, vomiting, and diarrhea. In addition, there are effects on cells that produce blood, abnormal heart function, blood vessel damage, liver or kidney injury, and impaired nerve functioning. The ingestion of arsenic in drinking water has been associated with an elevated incidence of skin cancer. Epidemiological data demonstrate an association between occupational exposure to inhaled arsenic and lung cancer (ATSDR, 1991). The USEPA classifies arsenic as a group A carcinogen (sufficient evidence of carcinogenicity in humans) (IRIS, 1995).

Arsenic is a non-volatile solid. The mobility of arsenic in the environment depends on the solubility of the particular chemical form present. Most arsenic in the air is adsorbed to particulate matter and settles out according to particle size. Arsenic found in the soil is predominantly an insoluble, adsorbed form. Arsenic in soil and water may be reduced and methylated by soil organisms. Bioconcentration of arsenic occurs primarily in aquatic algae and lower invertebrates. Biomagnification varies by species with some fish and invertebrates containing elevated levels of arsenic compounds. Terrestrial plants uptake arsenic from the soil and air (ATSDR, 1991).

1,2-DICHLOROETHANE

1,2-Dichloroethane is used primarily as a starting material in the manufacture of vinyl chloride, tetrachloroethylene, trichloroethylene, and other chlorinated organic compounds. It is also used as a degreasing agent, solvent, fumigant for grain and upholstery, varnish and paint remover, and lead-scavenging agent in gasoline. Primary routes of exposure include breathing air, drinking water, and skin absorption (IRP, 1989).

Short-term exposures to vapor concentrations greater than 125 ppm produce irritation of the eyes, nose and throat. Ingestion or inhalation of the compound causes dizziness, nausea, vomiting, increasing stupor, cyanosis, rapid pulse, loss of consciousness, and injury to the liver, kidneys and lungs. The dermal LD₅₀ in rabbits is 2800 mg/kg of body weight (IRP, 1989). In addition, reproductive effects have been noted in rats at an oral dose of 120 mg/kg-day (ATSDR, 1992).

Chronic exposures are associated with loss of appetite, nausea, vomiting, gastric pain, neurological disturbances, and liver and kidney impairment. In animal studies, death was outcome for inhalation exposures greater than 400 ppm. The USEPA has classified 1,2-dichloromethane as a Group B2 carcinogen (probable human carcinogen) (IRP, 1989).

1,2-Dichloroethane is expected to be highly mobile in the soil/ground-water system. Adsorption to soil is low; volatilization from soils is the primary transport process. Microbial degradation in soil is not expected to be significant (IRP, 1989).

1,1-DICHLOROETHENE

1,1-Dichloroethene (1,1-DCE), also known as 1,1-dichloroethylene and vinylidene chloride, is a clear, colorless liquid that has a mild, sweet chloroform-like odor. It is a man-made chemical used to make copolymers, modacrylic fibers and other chemicals. It evaporates quickly at room temperature and is flammable. 1,1-DCE may enter the body by inhalation of contaminated air or ingestion of contaminated food or water (ATSDR, 1992).

There have been no studies that reported death of humans following inhalation exposure to 1,1-DCE. Lethality in laboratory animals after inhalation exposure varies considerably depending on species, strain, sex and nutritional status. When experimental animals were exposed to high concentrations of 1,1-DCE, damage to the liver, kidney and central nervous system has been reported. The liquid is moderately irritating to the eyes and skin (ATSDR, 1992).

Long-term effects of 1,1-DCE include liver and kidney damage. There is also evidence of mutagenicity in several test systems. A statistically significant increase in kidney tumors was observed in mice exposed to 1,1-DCE via inhalation. Other tumor types were also reported in this study. The USEPA has classified 1,1-DCE as a Group C carcinogen (possible human carcinogen) (IRP, 1989).

The environmental fate of 1,1-DCE is influenced largely by its high volatility; the majority evaporates to the atmosphere. Because it is water soluble and weakly adsorbed to soil/sediment, the potential for surface water or ground-water contamination and transport is great. Transformation processes are not expected to be great in natural soil (IRP, 1989).

DIELDRIN

Dieldrin is a chlorinated hydrocarbon compound that has been widely used as a domestic pesticide. Its primary use in the past was as an insecticide for corn and for termite control. Human exposure can result from inhalation and ingestion. Dermal exposure is limited to the past for those involved in manufacturing or application of pesticides containing dieldrin. Dermal exposure could occur when contact at hazardous waste sites or contaminated soils/sediments.

Dieldrin is absorbed into the bloodstream from the gastrointestinal tract after ingestion or from the lungs after inhalation. It is quickly distributed throughout the body after intake, but is rapidly concentrated in fatty tissues due to its lipophilic nature where it can remain for years. Other organs which tend to have high concentrations are the liver, kidneys, brain, and blood. Dieldrin is excreted, mainly in the feces, in the form of several metabolites that are more polar than the parent compounds (ATSDR, 1991).

Signs of toxicity include effects on the central nervous system with symptoms of headache, dizziness, nausea, general malaise, and vomiting, followed by muscle twitching, myoclonic jerks,

and even convulsions. These symptoms are reversible with time after removal from the source of exposure. Death may result from anoxemia (ATSDR, 1991)

No chronic effects have been observed in humans exposed to low levels of dieldrin in the workplace. Animal studies, however, have indicated a decrease in immune function and liver damage resulting from dieldrin exposure. In addition, liver cancer has been observed in mice chronically exposed to dieldrin (ATSDR, 1991). Dieldrin has been classified by the USEPA as a probable human carcinogen, class B2. There is sufficient evidence that exposure to dieldrin has resulted in liver cancer in animal studies (IRIS, 1995).

HEPTACHLOR/HEPTACHLOR EPOXIDE

Heptachlor is a man-made pesticide used in homes, buildings, and on food crops, but it is no longer manufactured in the United States. It is a white powder in its pure form, while technical grade heptachlor is a tan powder. It is a component of the pesticide, chlordane. Heptachlor epoxide is a breakdown product of heptachlor, and is a result of bacterial activity (ATSDR, 1992).

Heptachlor is readily absorbed into the gastrointestinal tract and the skin. It is slowly eliminated via the bile duct to the feces. Heptachlor epoxide is an oxidation product which is formed by plants and animals after exposure to heptachlor. Heptachlor epoxide is often detected in human milk, blood and other body tissues and is more harmful than heptachlor itself. Other breakdown products are less harmful (ATSDR, 1992).

Heptachlor is acutely toxic via the oral and dermal routes. No studies are available to show that inhalation of heptachlor is harmful to humans. Hepatotoxicity is the most sensitive noncancer endpoint with animal acute and chronic studies describing evidence of severe liver damage, increased liver weight, and increased levels of serum liver enzymes. Central nervous system disorders are also evident. Long-term oral exposures in animals are also associated with kidney, adrenal, and blood defects. It is also fetotoxic and caused reduced fertility in laboratory rodents. Chronic oral exposure to heptachlor or heptachlor epoxide increased the incidence of liver carcinomas in several species of mice. Studies of pesticide applicators indicate a slight increased incidence in cancers of the lung, skin and bladder (ATSDR, 1992). The USEPA classifies heptachlor and heptachlor epoxide as group B2 carcinogens (probable human carcinogens) (IRIS, 1995).

Heptachlor and its epoxide are persistent in soil with half-lives of two and fourteen years, respectively. Heptachlor and its epoxide can evaporate into the air and ultimately travel long distances. Heptachlor epoxide dissolves more easily in water than does heptachlor and evaporates slowly. Heptachlor does not dissolve easily in water and will bind to sediments. In soil and water heptachlor is broken down by bacteria to its epoxide and other substances. Bioaccumulation of both heptachlor and heptachlor epoxide occur in aquatic and terrestrial organisms, where they are stored in fatty tissues for long periods of time (ATSDR, 1992).

LEAD

Lead is a commonly used, naturally occurring metal which is ubiquitous throughout the environment. Lead is found in construction materials, leaded gasoline, radiation protection gear, paint, ceramics, plastics, antimonial lead storage batteries, and ammunition. Lead is well absorbed from all portions of the respiratory tract including the nasal passages. Absorption from the gastrointestinal tract is less rapid and complete than from the respiratory tract. Dermal absorption is a much less significant route of lead absorption than inhalation or ingestion. Absorbed lead is distributed to the soft tissues of the body with the greatest distribution to the kidneys and the liver. Lead is eventually transferred to the skeleton where 90% of the body's long-term burden is stored. Approximately 70% of the absorbed lead dose is excreted. The portion of lead that is not absorbed is excreted in the feces. Most of the absorbed lead is excreted by the kidneys or through biliary clearance into the gastrointestinal tract (ATSDR, 1988).

Lead intoxication in humans can occur by ingestion and inhalation of dust or fumes. Lead interferes with the blood making process, production of energy, and transmission of nerve impulses.

Symptoms of lead intoxication include anorexia, malaise, headaches, and intestinal spasms. The neuromuscular disease, lead palsy, is a result of advanced subacute poisoning (lead blood levels of 70 Tg/dL and less), and is characterized by muscle weakness leading to paralysis. Lead encephalopathy is the term used for the central nervous system manifestation which is commonly seen in children when lead blood levels reach 90 Tg/dL. Symptoms include clumsiness, dizziness, delirium, convulsions, and coma. The mortality rate is 25% when the brain is involved, with survivors suffering long-term neurological problems (ATSDR, 1988).

Chronic low level lead exposure (lead blood levels of 30-50 Tg/dL) is associated with learning disabilities. Lead toxicity is defined by the Centers for Disease Control as a blood level of 10 Tg/dL or greater (child). Kidney damage occurs after prolonged exposures, and is apparently reversible. In epidemiological studies, lead intoxication is also associated with increased blood pressure which is symptomatic of kidney damage. Lead exposure is associated with reproductive effects such as miscarriages and temporary sterility. Lead readily crosses the placenta. In all systems, the concentrations of essential nutrients and elements have a significant impact on the degree of toxicity seen with lead exposures. Occupational exposure to airborne lead is associated with an increased incidence of total malignant neoplasms, cancers of the digestive tract and cancers of the respiratory tract. An increased incidence in kidney cancer was seen in lead smelter workers exposed by inhalation and in various animal species exposed by ingestion at levels of 500 ppm and above. The USEPA has classified lead as a group B2 carcinogen based on animal studies (probable human carcinogen with inadequate or no evidence in humans) (ATSDR, 1988; IRIS, 1995; USEPA, 1994c).

The mobility of lead in soil is dependent on the chemical properties of the soil. Lead can react with sulfates, carbonates, and phosphates or combine with clays and organic matter which limits the further migration of lead through the soil matrix. Lead in surface waters is usually present as suspended solids. Atmospheric lead is removed by dry deposition and rainout. Lead does not

significantly bioaccumulate in fish. Lead localizes in fish skin which serves to reduce human exposures by fish consumption. Lead is toxic to wildlife, particularly water fowl, through their consumption of lead shot. Tetraethyl lead is biodegradable, but inorganic lead concentrations above 5 Tg/L can be toxic to microorganisms. As water hardness increases, the acute toxicity of lead to freshwater aquatic species decreases (ATSDR, 1988).

POLYCYCLIC AROMATIC HYDROCARBONS

Polycyclic aromatic hydrocarbons (PAHs) are a diverse class of compounds formed as a result of incomplete combustion of organic compounds with insufficient oxygen. As pure chemicals, PAHs generally exist as colorless, white, pale yellow, or green solids. This leads to the formation of C-H free radicals which can polymerize to form various PAHs. Although the health effects of the individual PAHs are not exactly alike, the following PAHs are considered as three groups in this profile (ATSDR, 1993).

Low Molecular Weight Compounds (152-178g/mol)

acenaphthene
acenaphthylene
anthracene
fluorene
phenanthrene

Medium Molecular Weight Compounds (202 g/mol)

fluoranthene
pyrene

High Molecular Weight Compounds (228-278 g/mol)

benzo(a)anthracene (B[a]A)
benzo(b)fluoranthene (B[b]F)
benzo(j)fluoranthene (B[j]F)
benzo(k)fluoranthene (B[k]F)
benzo(g,h,i)perylene (B[ghi]P)
benzo(a)pyrene (B[a]P)
benzo(e)pyrene (b[e]P)
chrysene
dibenz(a,h)anthracene (D[ah]A)
indeno(1,2,3-c,d)pyrene (I[123cd]P)

PAHs are present in the environment from both natural and anthropogenic sources. As a group, they are widely distributed in the environment. Humans may be exposed to PAHs in the environment, in tobacco smoke, in cooked food, and in the workplace. Typically, individuals are not exposed to a single PAH, but to a mixture of related chemicals (ATSDR, 1993). PAHs are readily absorbed into the bloodstream from the gastrointestinal tract after ingestion or the lungs after inhalation. PAHs are metabolized primarily in the liver and excreted in the feces.

Most of the information available for PAHs are from studies on experimental animals. Adverse effects in humans are generally not observed, but have been documented. Hematologic effects (myelosuppression) were produced in people after intravenous administration of anthracene-containing chemotherapeutic agents. Dermal effects have been documented. Regressive verrucae followed repeated topical application of B[a]P over a four-month period. In animals, oral administration of PAHs affect proliferating organs and tissue such as bone marrow, lymphoid organs, and intestinal epithelium (ATSDR, 1993).

PAHs are well established as experimental carcinogens for all routes through which humans would normally be expected to be exposed. In human occupational studies, lung and skin cancer have been demonstrated after inhalation exposure to PAHs. These workers were employed in coke production plants as roofers and as oil refinery workers. In experimental animals, the site of tumor induction is generally the point of first contact with the PAHs (i.e., stomach tumors after ingestion, lung tumors after inhalation, etc.) (ATSDR, 1993). The following PAHs are classified as B2 carcinogens by the USEPA: B[a]A, D[ah]A, B[a]P, B[b]F, B[k]F, chrysene and I[123cd]P; these PAHs are probable human carcinogens. Anthracene, B[ghi]P, pyrene, fluorene, naphthalene, fluoranthene, acenaphthylene and phenanthrene are class D carcinogens (not classifiable as to human carcinogenicity). No data exist on the carcinogenicity of acenaphthalene (IRIS, 1995).

Some of the transport and partitioning characteristics (Henry's law constant, K_{oc} values, K_{ow} values) of the 17 PAHs are roughly correlated to their molecular weights. PAH compounds in water tend to be removed by volatilization, binding to particulates or sediments or being bioaccumulated. The low molecular weight PAHs have Henry's Law constants in the range of 10^{-3} to 10^{-5} atm-m³/mol and are therefore associated with significant volatilization. The other PAHs volatilize to a lesser extent. In the atmosphere they are associated with particulate matter, especially soot, and can travel long distances. PAHs suspended in the air are thought to undergo direct photolysis very quickly (ATSDR, 1993).

PAHs have low water solubilities and high propensity for binding to particulate or organic matter. In general PAHs do not easily dissolve in water although they have been detected in groundwater in some distances. Medium and high molecular weight PAHs are primarily removed from the water column by deposition and some volatilization (they have K_{oc} values of 10^4 to 10^6 indicating strong tendencies to adsorb). Low molecular weight PAHs are removed by volatilization and biodegradation (they have K_{oc} values 10^3 to 10^4 indicating moderate potential to bind). In general sorption of PAHs to soil and sediment increases with increasing organic carbon content and is also directly dependent on particle size. The ultimate fate of PAHs in the sediment is believed to be biodegradation and biotransformation by microbes. In soils and water PAH breakdown generally takes weeks to months and is due primarily to the actions of microorganisms. Photodegradation also plays a role in PAH breakdown in water (ATSDR, 1993).

PAHs can be accumulated in organisms; the higher molecular weight compounds accumulating more easily than the lower molecular weight ones. Most organisms, however, metabolize and excrete PAHs rapidly, resulting in short lived bioaccumulation (ATSDR, 1993).

1,1,2,2-TETRACHLOROETHANE

1,1,2,2-Tetrachloroethane was commonly used to produce other chemicals such as paints and pesticides or as an industrial solvent and degreasing agent. Now, it is introduced into the environment as a minor impurity or chemical intermediate of other chlorinated solvents. Exposure may occur through inhalation of contaminated air, dermal contact or incidental ingestion in water or food (ATSDR, 1994).

Inhalation of airborne fumes at greater than 360 ppm can cause fatigue, vomiting, dizziness, and possibly unconsciousness. Breathing, drinking, or skin contact with lower concentrations may cause liver damage, stomach upsets, or dizziness. An oral acute LOAEL value of 75 mg/kg/day was established for liver damage in rats (ATSDR, 1994).

Long-term effects of human exposures are not established. Reproductive, systemic, or carcinogenic effects have not been noted in human populations. Chronic oral studies with rats noted reduced body weights (108 mg/kg/day) and renal effects (284 mg/kg/day). Based on a NCI mouse study, it is suspected to be a promoter of hepatic tumors. This compound has been classified as a group C carcinogen (limited evidence of carcinogenicity in animals and inadequate data for humans) (ATSDR, 1994).

1,1,2,2-Tetrachloroethane when released to the atmosphere is fairly stable with an estimated half-life in the troposphere of two years. When released to water, the compound will be lost by volatilization in a period of days. The compound is not expected to adsorb to soil, suspended solids, and sediment unless in high clay, dry soils. The bioconcentration factor in fathead minnows has been reported as 49 which indicates little tendency for the compound to bioaccumulate in fish and aquatic organisms (ATSDR, 1994).

TETRACHLOROETHENE (PCE)

Tetrachloroethene or tetrachloroethylene is a clear, colorless, nonflammable liquid that has a characteristic odor. It is a widely used solvent, particularly as a dry cleaning agent, a degreaser, a chemical intermediate, and a fumigant, and was given orally as a medical treatment for hookworms. The most significant exposure probably occurs in the industrial environment by inhalation. It is readily absorbed after ingestion or inhalation, but dermal absorption is poor. However, skin irritation may result from direct contact with the undiluted liquid. The main excretion pathway is through exhalation of the unmetabolized compound (ATSDR, 1992).

In confined, poorly ventilated areas, single exposures to high concentrations of tetrachloroethene can result in dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, and possibly unconsciousness and death. The consequences of chronic exposure to

tetrachloroethene by breathing or ingesting low levels of the chemical are not known. In laboratory animals, studies were conducted using higher concentrations than normally found in an environmental setting. These studies suggested the potential for tetrachloroethene to result in liver and kidney damage, birth defects, toxicity to pregnant animals, liver cancer and leukemia. Based on evidence from animal studies, tetrachloroethene is considered to be carcinogenic. The USEPA classifies tetrachloroethene as a B2 carcinogen (probable human carcinogen based on animal studies, but inadequate or no evidence in humans)

Tetrachloroethene found in surface waters or on soil surfaces will predominantly evaporate into the atmosphere. However, tetrachloroethene is moderately to highly mobile in soil and susceptible to leaching. In subsurface soils where volatilization cannot occur, tetrachloroethene is only slowly degraded and may be relatively persistent. Studies have shown that tetrachloroethene has a low bioaccumulation potential (ATSDR, 1992).

TETRACHLOROMETHANE (Carbon Tetrachloride)

Tetrachloromethane, more commonly referred to as carbon tetrachloride, is a clear, heavy liquid with a sweet aromatic odor. It is a synthetic chemical with no natural sources. Because it evaporates very easily, it is not usually encountered in its liquid state in the environment. Carbon tetrachloride is readily absorbed from the gastrointestinal tract and more slowly absorbed through the lungs and skin. Most carbon tetrachloride leaves the body by being exhaled through the lungs within a few hours after exposure.

Acute exposures of carbon tetrachloride to humans have shown a wide range of effects. Prior exposure to alcohol, phenobarbital, and some pesticides have been shown to increase the effects of carbon tetrachloride. Single exposures to low concentrations may cause symptoms such as irritation of the eyes, moderate dizziness and headache which disappear once exposure is discontinued. Exposure to higher concentrations will cause the same symptoms as above, but additional symptoms of nausea, loss of appetite, mental confusion, agitation and the feeling of suffocation may be seen. Chronic exposure to carbon tetrachloride produces symptoms of fatigue, lassitude, giddiness, anxiety, headache and muscle twitching. Organ damage is usually restricted to the liver, although there are some reported cases of kidney damage. After chronic exposure there is usually regeneration in these organs. Carbon tetrachloride is carcinogenic in animals producing mainly liver tumors. The USEPA has classified carbon tetrachloride as a group B2 carcinogen indicating that, based on animal studies, it is probably a human carcinogen, although there are no adequate studies of cancer in humans.

Most carbon tetrachloride is released to the environment in the atmosphere. Although it is moderately soluble in water, its high rate of volatilization results in only about 1% of the total carbon tetrachloride in the environment being in surface waters and oceans. Likewise, carbon tetrachloride tends to volatilize from tap water used for showering, bathing and cooking inside a home (ATSDR, 1989).

1,1,1-TRICHLOROETHANE

1,1,1-Trichloroethane (1,1,1-TCA) is a colorless liquid with a sweet characteristic odor. It is used as a solvent for adhesives, in metal degreasing, in textile processing, as an aerosol propellant and in spot cleaners. 1,1,1-TCA can enter the body through the lungs by breathing contaminated air or through the digestive system by eating or drinking contaminated food or water. Most 1,1,1-TCA is exhaled regardless of how it entered the body, but small metabolized amounts leave in the urine (ATSDR, 1990).

Acute inhalation exposure to concentrations greater than 500 ppm of 1,1,1-TCA in humans may result in dizziness, lightheadedness and loss of balance and coordination. These effects are reversible when the exposure is discontinued. Continued breathing of higher concentrations of 1,1,1-TCA could lead to unconsciousness, a decrease in blood pressure and cardiac arrest. Although the health effects of long-term low dose exposure in humans is unknown, studies in experimental animals have shown that damage occurs to the breathing passages, lungs and liver following inhalation of high levels. Studies in experimental animals have shown that exposure to high concentrations of 1,1,1-TCA during pregnancy could result in birth defects. If 1,1,1-TCA comes into direct contact with skin for more than five minutes, a mild irritation may occur, but would disappear in a few hours after removal of the 1,1,1-TCA. The USEPA classifies 1,1,1-TCA in group D (not classifiable as to human carcinogenicity).

1,1,1-TCA evaporates easily and is moderately water soluble. It volatilizes from soil, surface water, and from unconfined ground water to the soil. If released to soil as a liquid, 1,1,1-TCA does not sorb to soil and may leach to groundwater. 1,1,1-TCA is not believed to bioconcentrate in fish and aquatic organisms (ATSDR, 1990).

TRICHLOROETHENE (TCE)

Trichloroethene (TCE) or trichloroethylene is a colorless liquid at room temperature with an odor similar to ether. The major use of this chemical is as a solvent for degreasing metal parts. Exposure to TCE can occur via inhalation and by ingestion of contaminated food and water. Absorption of TCE following inhalation exposure is high with approximately 50% of the inhaled dose absorbed and 50% exhaled. Dermal absorption is poor in humans. Once absorbed the majority of the TCE is metabolized and then excreted in the urine, only a relatively small amount of absorbed TCE is exhaled via the lungs (ATSDR, 1991).

Trichloroethene is not acutely toxic by the inhalation or oral routes. Oral and inhalation exposures affect the central nervous system, liver and kidney. Trichloroethane was once used as an anesthetic; inhalation of high doses (5000 ppm) produces anesthetic effects. Human epidemiology studies have not shown a clear connection between exposure to trichloroethene and increased cancer risk (ATSDR, 1991). Laboratory animals exposed by inhalation developed cancers in the lung and liver, while animals exposed orally had increased incidence of liver and kidney carcinomas. The USEPA classifies TCE as a group B2 carcinogen (probable human carcinogen but inadequate or no

evidence in humans)(HEAST, 1994). The USEPA is currently re-evaluating the toxicity and carcinogenicity of trichloroethene (IRIS, 1994).

Environmentally, trichloroethene volatilizes rapidly from water. It is highly mobile in soil and quickly leaches to the ground water. It exists predominantly in the vapor phase with some removal from the atmosphere via wet deposition. TCE is believed to have a low bioaccumulation potential in fish and other aquatic creatures (ATSDR, 1991).

TRICHLOROMETHANE (Chloroform)

Chloroform is a colorless or water-white liquid with a pleasant non-irritating odor. It can enter the body by breathing air, drinking water or eating food that contains chloroform. Because chloroform can penetrate the skin, it may enter the body by bathing or showering in water containing chloroform. Water that has been chlorinated for disinfectant purposes may contain chloroform as a by-product. In general chloroform is rapidly eliminated from the body (ATSDR, 1991).

Short-term inhalation exposure to high concentrations (900 ppm) results in CNS effects such as tiredness, dizziness and headache while higher concentrations (8,000 to 10,000 ppm) may result in unconsciousness and death. Longer-term exposure to chloroform can affect liver and kidney function. Dermal exposures may cause sores on the skin. Chloroform was used as a surgical anesthetic for many years before its harmful effects on the liver and kidneys were recognized. Chronic oral doses of chloroform at concentrations greater than 60 mg/kg/day have been found to result in liver and kidney cancer in laboratory animals. Epidemiological studies found a correlation between chlorinated drinking water and cancer of the bladder, large intestine and rectum in humans. However, chloroform is only one of many chlorinated compounds found in chlorinated drinking water that are potentially carcinogenic. The USEPA classifies chloroform as a group B2 carcinogen (probable human carcinogen based on animal studies, but inadequate or no evidence in humans) (IRIS, 1994).

Chloroform is released to the environment as a result of its manufacture and use in the chlorination of water and from other water treatment processes. Most of the chloroform released to the environment will eventually volatilize from water and soil to the atmosphere. Chloroform in the atmosphere may be degraded by photochemical reactions. Because of its limited ability to sorb to soil and its high water solubility, chloroform will leach from soil to groundwater where it may persist for a long time (ATSDR, 1991).

VINYL CHLORIDE

Vinyl chloride is a colorless gas with a mild, sweet odor. It is used to make polyvinyl chloride (PVC), as a refrigerant gas, and in the manufacture chlorinated compounds.

Acute exposure in humans to approximately 10,000 ppm vinyl chloride for five minutes results in central nervous system effects including dizziness, disorientation, nausea, and headaches. Death

has resulted when humans were acutely exposed to high levels of vinyl chloride. Acute inhalation of 100,000 to 400,000 ppm vinyl chloride has resulted in death in laboratory animals. Inhalation of vinyl chloride has been reported to result in impaired liver function, liver damage, and central nervous system effects at doses as low as 10 ppm in laboratory animals. Chronic inhalation exposure has also resulted in a syndrome known as vinyl chloride disease. Symptoms include circulatory disturbances in the extremities, and blood, lung, and liver effects. In animals, chronic exposure to oral and inhaled vinyl chloride resulted in decreased longevity, vinyl chloride syndrome, toxic hepatitis, kidney effects, and cancer (ATSDR, 1991). Vinyl chloride has been classified as a group A carcinogen in humans (HEAST, 1994). Increases in the occurrence of tumors in the liver (angiosarcomas), brain, lung, and blood making tissues have been associated with occupational exposure to vinyl chloride in humans (ATSDR, 1991).

Vinyl chloride is a highly mobile compound and may leach into ground water. It does not adsorb to soil. Vinyl chloride in surface water will volatilize to the atmosphere. In the atmosphere, vinyl chloride exists as a vapor and is rapidly degraded. It does not bioconcentrate significantly in aquatic organisms (ATSDR, 1991; Howard, 1990).

Appendix A Toxicology Profiles for Contaminants

A.1 Inorganic Arsenic

Toxicity Classification:

EPA: Group A (known human carcinogen)

Toxicity Criteria:

Reference Dose (RfD)—Oral: 0.0003 milligrams per kilogram (mg/kg)/day

Uncertainty/Modifying Factor: 3

Principal Studies: Tseng et al., 1968; Tseng, 1977

Cancer Slope Factor—Oral: 1.5 (mg/kg/day)⁻¹

Principal Studies: Tseng et al., 1968; Tseng, 1977

Cancer Slope Factor—Inhalation: 4.3 E⁻³ (mg/m³)⁻¹

Principal Studies: Brown and Chu, 1983a-c; Lee-Feldstein, 1983; Higgins, 1982; Enterline and Marsh, 1982

Target Organs (Primary):

- skin (hyperpigmentation and hyperkeratosis)
- nervous system (peripheral neuropathy)
- vascular system
- hematopoietic system
- gastrointestinal
- lungs
- liver
- kidney

A.1.1 General Information

The toxicity of inorganic arsenic (As) depends on its valence state (-3, +3, or +5), and also on the physical and chemical properties of the compound in which it occurs. Trivalent (As⁺³) compounds are generally more toxic than pentavalent (As⁺⁵) compounds, and the more water soluble compounds are usually more toxic and more likely to have systemic effects than the less soluble compounds, which are more likely to cause chronic pulmonary effects if inhaled.

One of the most toxic inorganic arsenic compounds is arsine gas (AsH₃). It should be noted that laboratory animals are generally less sensitive than humans to the toxic effects of inorganic arsenic. In addition, in rodents, the critical effects appear to be immunosuppression and hepato-

renal dysfunction, whereas in humans the skin, vascular system, and peripheral nervous system are the primary target organs.

Water soluble inorganic arsenic compounds are absorbed through the G.I. tract (>90 percent) and lungs; distributed primarily to the liver, kidney, lung, spleen, aorta, and skin; and excreted mainly in the urine at rates as high as 80 percent in 61 hrs following oral dosing (EPA, 1984). Pentavalent arsenic is reduced to the trivalent form and then methylated in the liver to less toxic methylarsinic acids (ATSDR, 1989).

A.1.2 Basis for Toxicity Criteria

The Reference Dose (RfD) for chronic oral exposures, 0.0003 mg/kg/day, is based on a No Observed Adverse Effects Level (NOAEL) of 0.0008 mg/kg/day and a Lowest Observed Adverse Effects Level (LOAEL) of 0.014 mg/kg/day for hyperpigmentation, keratosis, and possible vascular complications in a human population consuming arsenic-contaminated drinking water (EPA, 1991a). Because of uncertainties in the data, the U.S. Environmental Protection Agency (EPA) (1991a) states that "strong scientific arguments can be made for various values within a factor of 2 or 3 of the currently recommended RfD value." The subchronic Reference Dose is the same as the chronic RfD, 0.0003 mg/kg/day (EPA, 1992).

Acute inhalation exposures to inorganic arsenic can damage mucous membranes, cause rhinitis, pharyngitis and laryngitis, and result in nasal septum perforation (EPA, 1984). Epidemiological studies have revealed an association between arsenic concentrations in drinking water and increased incidences of skin cancers (including squamous cell carcinomas and multiple basal cell carcinomas), as well as cancers of the liver, bladder, respiratory, and gastrointestinal tracts (EPA, 1987; IARC, 1987; Chen et al., 1985, 1986). Occupational exposure studies have shown a clear correlation between exposure to arsenic and lung cancer mortality (IARC, 1987; EPA, 1991a). EPA (1991a) has placed inorganic arsenic in weight-of-evidence group A, human carcinogen. A drinking water unit risk of $5\text{E-}5(\text{mg/L})^{-1}$ has been proposed (EPA, 1991a); derived from drinking water unit risks for females and males that are equivalent to slope factors of $1.0\text{E-}3(\text{mg/kg/day})^{-1}$ (females) and $2.0\text{E-}3(\text{mg/kg/day})^{-1}$ (males) (EPA, 1987). For inhalation exposures, a unit risk of $4.3\text{E-}3(\text{mg/m}^3)^{-1}$ (EPA, 1991a) and a slope factor of $5.0\text{E+}1(\text{mg/kg/day})^{-1}$ have been derived (EPA, 1992).

Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. Dermatitis (exfoliative erythroderma), muscle cramps, cardiac abnormalities, hepatotoxicity, bone marrow suppression and hematologic abnormalities (anemia), vascular lesions, and peripheral neuropathy (motor dysfunction, paresthesia) have also been reported (U.S. Air Force, 1990; ATSDR, 1989; EPA, 1984). Primary target organs are the skin (hyperpigmentation and hyperkeratosis) [Terada et al. 1960; Tseng et al., 1968;], nervous system (peripheral neuropathy), and vascular system [Tseng et al., 1968]. Anemia, leukopenia, hepatomegaly, and portal hypertension have been reported. In addition, possible reproductive effects include a high male-to-female birth ratio.

In animals, acute oral exposures can cause gastrointestinal and neurological effects. Chronic exposures have also resulted in mild hyperkeratosis and bile duct enlargement with hyperplasia, focal necrosis, and fibrosis. Reduction in litter size, high male-to-female birth ratios, and fetotoxicity without significant fetal abnormalities occur after oral dosing; however, parenteral

dosing has resulted in exencephaly, encephaloceles, skeletal defects, and urogenital system abnormalities.

It is reported that a 12 percent incidence of skin abnormalities occurred in children whose drinking water contained 0.6 to 0.8 mg As/L. The earliest cases occurred about 4 to 5 years after the initial exposure. Cardiovascular effects, including Raynaud's syndrome, acrocyanosis, angina pectoris, hypertension, myocardial infarction, mesenteric thrombosis, systemic occlusive arterial disease, bronchiectasis, and recurrent broncho-pneumonia were also observed in this group of subjects). The bronchiectasis and recurrent broncho-pneumonia were attributed to an immunosuppressive action of arsenic in the lungs. A significant decrease in the incidence of skin abnormalities was observed after a reduction in drinking water concentration to about 0.04 mg/L. After 4 years at the lower exposure, effects were rarely seen in children younger than 12 years old). Central nervous system deficits (hearing loss, eye damage, abnormal EEGs, mental retardation, and epilepsy), electrocardiographic changes (elevated ST wave and extended QT interval), and skin abnormalities (melanosis, desquamation, rashes, and hyperkeratosis) occurred in infants who had been fed arsenic-contaminated milk for 1 to 2 months. It was estimated that the daily arsenic intake was about 3 mg/day (EPA, 1984).

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A.2 Polycyclic Aromatic Hydrocarbons (PAHs)

Toxicity Classification:

EPA: B2 (probable human carcinogen, includes carcinogenic PAHs; B(a)P, B(a)A, B(b)F, B(k)F, carbazole, chrysene, D(ah)A, indeno(1,2,3-cd)pyrene, EPA, 1995)

Comment: Classification is based on multiple studies indicating carcinogenicity of individual components of PAHs mixture through inhalation, and dermal contact exposures

Toxicity Criteria:

Reference Dose (RfD)–Oral: Acenaphthene = 6.0E-2, anthracene = 3.0E-1, fluoranthene, and fluorene = 4.0E-2, and pyrene = 3.0 E-2

Cancer Slope Factor–Oral: B(a)P - 7.3 (mg/kg/day)⁻¹

Comment: Mouse skin carcinogenesis. Other carcinogenic PAHs are evaluated based on their relative potency compared with B(a)P.

The relative potency factors are as follows: B(a)P = 1.0, B(a)A = 0.1, B(b)F = 0.1, B(k)F = 0.01, chrysene = 0.001, D(ah)A = 1.0, indeno(123-cd)pyrene = 0.1.

Target Organs (Primary):

- skin (cancer)
- immune system
- nervous system

A.2.1 General Information

PAHs are products of incomplete combustion of organic materials from sources such as cigarette smoke, municipal incinerators, wood stove emissions, coal conversion, and fossil

fuel burning (diesel and gasoline automobile exhausts). PAHs are a diverse class of compounds formed as a result of incomplete combustion of organic compounds with insufficient oxygen. This leads to the formation of C-H free radicals, which can polymerize to form various PAHs. Among these PAHs are compounds such as benzo(a)pyrene (B[a]P), benz(a)anthracene (B[a]A) and Dibenz(a,h)anthracene (ATSDR, 1988).

PAHs are present in the environment from both natural and anthropogenic sources. As a group, they are widely distributed in the environment, having been detected in animal and plant tissue, sediments, soils, air, and surface water. Humans may be exposed to PAHs in the environment, in tobacco smoke and cooked food, and in the work place. Typically, individuals are not exposed to a single type of PAHs, but to a mixture of related chemicals (ATSDR, 1988).

The environmental fate of PAHs is determined largely by their low water solubilities and high propensity for binding to particulate or organic matter. In the atmosphere they are associated with particulate matter, especially soot. In aquatic environments, PAHs are usually bound to suspended particles or bed sediments. PAHs suspended in the air are thought to undergo direct photolysis very quickly. The ultimate fate of PAHs in the sediment is believed to be biodegradation and biotransformation by benthic organisms (EPA, 1986).

Unsubstituted lower molecular weight PAH compounds that contain 2 or 3 rings exhibit significant acute toxicity and other adverse effects to some organisms, but are noncarcinogenic. The higher molecular weight PAHs that contain 4 to 7 rings are significantly less toxic, but many of these are demonstrably carcinogenic, mutagenic, or teratogenic to a wide variety of organisms including fish, birds, and mammals. These animals have been exposed to PAHs (particularly B[a]P) by several routes of exposure including dermal absorption, ingestion, injection, and inhalation. The metabolism is important in determining their carcinogenicity and effects and many of the metabolites are more toxic than the parent compound. PAHs in the water column also accumulate in organisms, but many organisms metabolize and excrete PAHs rapidly, resulting in short-lived bioaccumulation (EPA, 1986).

A.2.2 Basis for Toxicity Criteria

There is no direct information available for the effects of PAHs on humans. All of the information available for PAHs is from studies on experimental animals. PAHs are well-established as experimental carcinogens for all routes to which humans would normally be exposed. Non-carcinogenic effects reported for PAHs include skin lesions and non-cancer lung diseases such as bronchitis. Benzo(a)pyrene has been associated with developmental toxicity and adverse reproductive effects in experimental animals (ATSDR, 1988).

Risk is assessed separately for carcinogens and noncarcinogens. Benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, B(a)P, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene are classified as B2 carcinogens (probable human carcinogen; sufficient evidence of carcinogenicity in animals; inadequate evidence of carcinogenicity in humans). The other PAHs have a D classification (not classified; inadequate evidence of carcinogenicity in animals). Because of recent changes in the interpretation of toxicological data, the following discussion regarding the source of information used to develop the action

levels is presented. The animal data consist of dietary, gavage, inhalation, intratracheal instillation, and dermal and subcutaneous studies in numerous strains of at least four species of rodents and several primates. Repeated B(a)P administration has been associated with increased incidences of total tumors and of tumors at the site of exposure. Distant site tumors have also been observed after B(a)P administration by various routes. B(a)P is frequently used as a positive control in carcinogenicity bioassays.

B(a)P administered in the diet or by gavage to mice, rats, and hamsters has produced increased incidences of stomach tumors. Neal and Rigdon (1967) fed B(a)P (purity not reported) at concentrations of zero, 1, 10, 20, 30, 40, 45, 50, 100 and 250 parts per million (ppm) in the diets of male and female CFW-Swiss mice. The age of the mice ranged from 17 to 180 days old, the treatment time from 1 to 197 days, and the size of the treated groups from 9 to 73. There were 289 mice (number of mice/sex not stated) in the control group. No forestomach tumors were reported in the zero-, 1- and 10-ppm dose groups. The incidence of forestomach tumors in the 20-, 30-, 40-, 45-, 50-, 100- and 250-ppm dose groups were 1/23, 0/37, 1/40, 4/40, 23/34, 19/23 and 66/73, respectively. The authors felt that the increasing tumor incidences were related to both the concentration and the number of doses administered. Historical control forestomach tumor data are not available for CFW-Swiss strain mice. In historical control data from a related mouse strain, SWR/J Swill, the forestomach tumor incidence rate was 2/268 and 1/402 for males and females, respectively (Rabstein et al., 1973)

Brune et al. (1981) fed 0.15 mg/kg B(a)P (reported to be highly pure) in the diet of 32 Sprague-Dawley rats/sex/group either every 9th day or 5 times per week. These treatments resulted in annual average doses of 6 or 39 mg/kg, respectively. An untreated group of 32 rats/sex served as the control. Rats were treated until moribund or dead; survival was similar in all groups. Histologic examinations were performed on each rat. The combined incidence of tumors of the forestomach, esophagus, and larynx was 3/64, 3/64 and 10/64 in the control group, the group fed B(a)P every 9th day and the group fed B(a)P 5 times/week, respectively. A trend analysis showed a statistically significant tendency for the proportion of animals with tumors of the forestomach, esophagus, or larynx to increase steadily with dose (Knauf and Rice, 1992).

As part of the same study, Brune et al. (1981) administered B(a)P (highly pure) orally to Sprague-Dawley rats by caffeine gavage. The rats were treated until moribund or dead; all rats were subjected to terminal histopathologic examination. Gavigated rats were divided into three dose groups of 32 rats/sex/group; the groups received 0.15 mg/kg per gavage either every 9th day (Group A), every 3rd day (Group B), or 5 times per week (Group C). These treatments resulted in annual average doses of 6, 18 or 39 mg/kg, respectively. Untreated and gavage (5 times/week) controls (32 rats/sex/group) were included. The median survival times for the untreated control group; the gavage control group; and groups A, B, and C were 129, 102, 112, 113, and 87 weeks, respectively. The survival time of Group C was short compared with controls, and may have precluded tumor formation (Knauf and Rice, 1992). The combined tumor incidence in the forestomach, esophagus, and larynx was 3/64, 6/64, 13/64, 26/64, and 14/64 for the untreated control group, gavage control group, group A, group B, and group C, respectively. There was a statistically significant association between the dose and the proportions of rats with tumors of the forestomach, esophagus, or larynx.

This association is not characterized by a linear trend. The linearity was affected by the apparently reduced tumor incidence that is seen in the high-dose group (Knauf and Rice, 1992).

Intratracheal instillation and inhalation studies in guinea pigs, hamsters, and rats have resulted in elevated incidences of respiratory tract and upper digestive tract tumors (EPA, 1991a). Intraperitoneal B(a)P injections have caused increases in the number of injection site tumors in mice and rats (reviewed in EPA, 1991a). B(a)P has also been reported to be carcinogenic in animals when administered by the following routes—i.v.; transplacentally; implantation in the stomach wall, lung, renal parenchyma, and brain; injection into the renal pelvis; and vaginal painting (EPA, 1991a).

At the June 1992 CRAVE Work Group meeting, it was noted that an error had been made in the 1991 document Dose-Response Analysis of Ingested Benzo[a]pyrene which is quoted in the Drinking Water Criteria Document for PAH. In the calculation of the doses in the Brune et al. (1981) study, it was erroneously concluded that doses were given in units of mg/year, whereas it was in fact mg/kg/year. When the doses are corrected, the slope factor is correctly calculated as 11.7 per (mg/kg)/day, as opposed to 4.7 per (mg/kg)/day as reported in the Drinking Water Criteria Document. The correct range of slope factors is 4.5 to 11.7 per (mg/kg)/day, with a geometric mean of 7.3 per (mg/kg)/day. A drinking water unit risk based on the revised slope factor is $2.1\text{E-}4$ per ($\mu\text{g/L}$). Therefore, these values have been changed on IRIS, and an Erratum to the Drinking Water Criteria Document is being prepared.

Risk estimates were calculated from two different studies in two species of outbred rodents (Neal and Rigdon, 1967; Brune et al., 1981). These studies have several commonalities, including mode of administration, tumor sites, tumor types, and the presumed mechanisms of action. The data sets were not combined before modeling (the preferred approach) because they used significantly dissimilar protocols.

The geometric mean from several slope factors, each considered to be of equal merit, was used to calculate a single unit risk. These four slope factor estimates span less than a factor of three, and each is based on an acceptable, but less-than-optimal, data set. Each estimate is based on a low-dose extrapolation procedure that entails the use of multiple assumptions and default procedures.

Clement Associates (1990) fit the Neal and Rigdon (1967) data to a two-stage dose response model. In this model, the transition rates and the growth rate of preneoplastic cells were both considered to be exposure-dependent. A term to permit the modeling of B(a)P as its own promoter was also included. Historical control stomach tumor data from a related, but not identical, mouse strain, SWR/J Swill (Rabstein et al., 1973) and the CFW Texas colony (Neal and Rigdon, 1967) were used in the modeling. In calculating the lifetime unit risk for humans, several standard assumptions were made—mouse food consumption was 13 percent of its body weight/day; human body weight was assumed to be 70 kg; and the assumed body weight of the mouse was 0.034 kg. The standard assumption of surface area equivalence between mice and humans was the cube root of $70/0.034$. A conditional upper bound estimate was calculated to be 5.9 per (mg/kg)/day (EPA, 1991a).

An EPA report (1991b) argued that the upper-bound estimate calculated in Clement Associates (1990) involved the use of unrealistic conditions placed on certain parameters of the equation. Other objections to this slope factor were also raised. The authors of this report used the Neal and Rigdon (1967) data to generate an upper-bound estimate extrapolated linearly from the 10 percent response point to the background of an empirically fitted dose-response curve (Clement Associates, 1990). Other results, from similar concepts and approaches used for other compounds, suggest that the potency slopes calculated in this manner are comparable to those obtained from a linearized multistage procedure for the majority of the other compounds. The upper bound estimate calculated in EPA (1991b) is 9.0 per (mg/kg)/day. The authors of EPA (1991b) selected a model to reflect the partial lifetime exposure pattern over different parts of the animals' lifetimes. The authors thought that this approach more closely reflected the Neal and Rigdon (1967) regimen. A Weibull-type dose-response model was selected to accommodate the partial lifetime exposure; the upper-bound slope factor calculated from this method was 4.5 per (mg/kg)/day.

EPA selected a slope factor for B(a)P of 7.3, which is a geometric mean of 4.5 to 11.7. EPA currently proposes to regulate carcinogenic PAHs based on their relative potency in producing skin tumors in mouse skin painting studies. The toxicity values (RfDs), critical effects, and uncertainties for five of the noncarcinogenic PAH compounds are verified and currently available on IRIS as listed above.

A.2.3 Standards and Criteria

Occupational Exposures: OSHA PEL (B[a]P) 0.2 mg/m³

The proposed maximum contaminant level (MCL) value for B(a)P is 0.0002 mg/L (proposed, 1990). The World Health Organization European standards for drinking water recommend a concentration of PAHs not to exceed 0.2 µg/L (EPA, 1988).

For ambient water quality criteria (AWQC) for protection of humans to water and fish, the consumption is 2.8E-3 µg/L; fish consumption alone is 3.11E-2 µg/L. The AWQC for protection of aquatic organisms is not available for fresh water organisms or for marine organisms: the acute LEC is 3.0E+2 µg/L and no chronic LEC is available. The values that are indicated as LEC are not criteria, but are the lowest effect levels found in the literature. LECs are given when the minimum data required to derive water quality criteria are not available. The values given represent PAHs as a class (45 FR 79318 (11/28/80)).

A.2.4 References

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A.3 Tetrachloroethylene

Toxicity Classification:

Classification: B2, probable human carcinogen (EPA, 1991).

Toxicity Criteria:

Reference dose (RfD)—Oral: 0.01 mg/kg/day (EPA, 1991)

Uncertainty Factor: 100

NOAEL: 20 mg/kg/day (converted to 14 mg/kg/day)

Principal Study: Buben and O'Flaherty, 1985

Cancer Slope Factor—Oral: $5.1 \times 10^{-2} \text{ (mg/kg/day)}^{-1}$

Unit Risk: $1.5 \times 10^{-6} \text{ (}\mu\text{g/L)}^{-1}$
(CRAVE-EPA group verified, pending input into IRIS; quantitative estimates were not calculated by the CRAVE Workgroup [EPA, 1991].)

Cancer Slope Factor—Inhalation: $2.03\text{E-}3 \text{ (mg/kg/day)}^{-1}$ (provisional value)

Unit Risk: $5.8 \text{ E-}7 \text{ (}\mu\text{g/m}^3\text{)}^{-1}$
(CRAVE-EPA group verified, pending input into IRIS; quantitative estimates were not calculated by the CRAVE Workgroup [EPA, 1991].)

Target Organs:

- liver and kidney (oral and inhalation exposure)
- central nervous system (inhalation exposure)

A.3.1 General Information

Tetrachloroethylene (CAS No. 127-18-4) is a halogenated aliphatic hydrocarbon with a vapor pressure of 17.8 mm Hg at 25°C (EPA, 1982). The chemical is used primarily as a solvent in industry and, less frequently, in commercial dry-cleaning operations (ATSDR, 1990). Occupational exposure to tetrachloroethylene occurs via inhalation, resulting in systemic effects, and via dermal contact, resulting in local effects. Exposure to the general population can occur through contaminated air, food, and water (ATSDR, 1990).

The respiratory tract is the primary route of entry for tetrachloroethylene (NTP, 1986; EPA, 1988). The chemical is rapidly absorbed by this route and reaches an equilibrium in the blood within 3 hours after the initiation of exposure. Tetrachloroethylene is also significantly absorbed by the gastrointestinal (g.i.) tract, but not through the skin (ATSDR, 1990). The chemical accumulates in tissues with high lipid content, where the half-life is estimated to be 55 hours (ATSDR, 1990), and has been identified in perirenal fat, brain, liver, placentofetal tissue, and amniotic fluid. The proposed first step for the biotransformation of tetrachloroethylene is the formation of an epoxide thought to be responsible for the carcinogenic potential of the chemical. Tetrachloroethylene is excreted mainly unchanged through the lungs, regardless of route of administration (NTP, 1986). The urine and feces comprise secondary routes of excretion. The major urinary metabolite of tetrachloroethylene, trichloroacetic acid, is formed via the cytochrome P-450 system (ATSDR, 1990).

A.3.2 Basis for Toxicity Criteria

A.3.2.1 Non-carcinogenicity

Acute exposure to high concentrations of the chemical (estimated to be greater than 1,500 ppm for a 30-minute exposure) may be fatal to humans. Chronic exposure causes respiratory tract irritation, headache, nausea, sleeplessness, abdominal pains, constipation, cirrhosis of the liver, hepatitis, and nephritis in humans; and microscopic changes in renal tubular cells, squamous metaplasia of the nasal epithelium, necrosis of the liver, and congestion of the lungs in animals (NTP, 1986). Some epidemiology studies have found an association between inhalation exposure to tetrachloroethylene and an increased risk for spontaneous abortion, idiopathic infertility, and sperm abnormalities among dry-cleaning workers. The adverse effects in humans are supported in part by the results of animal studies in which tetrachloroethylene induced fetotoxicity (but did not cause malformations) in the offspring of treated dams.

A carcinogenicity bioassay in mice and rats (NCI, 1977) provided the only available chronic oral toxicity data for tetrachloroethylene. For both mice and rats, dosage adjustments were made during the study. The time-weighted average doses of the chemical, administered for 78 weeks in corn oil, were as follows: male B6C3F₁ mice, 536 or 1,072 mg/kg; female mice, 386 or 772 mg/kg; Osborne-Mendel male rats, 471 or 941 mg/kg; and female rats, 474 or 949 mg/kg. Toxic nephropathy was observed at all doses in both sexes of mice and rats. The nephropathy was characterized by degenerative changes in the proximal convoluted tubule at the junction of the cortex and medulla, with fatty degeneration, cloudy swelling, and necrosis of the tubular epithelium.

RfDs for chronic and subchronic oral exposure to tetrachloroethylene are 0.1 mg/kg/day and 0.01 mg/kg/day, respectively (Buben and Flaherty, 1985; EPA, 1990; 1991). These values are based on hepatotoxicity observed in mice given ≥ 100 mg tetrachloroethylene/kg body weight for 6 weeks and a NOAEL of 20 mg/kg.

A.3.2.2 Carcinogenicity

Epidemiology studies of dry cleaning and laundry workers have demonstrated excesses in mortality due to various types of cancer, including liver cancer, but the data are regarded as

inconclusive because of various confounding factors (Lyng and Thygesen, 1990; EPA, 1988). The tenuous finding of an excess of liver tumors in humans is strengthened by the results of carcinogenicity bioassays in which tetrachloroethylene, administered either orally or by inhalation, induced hepatocellular tumors in mice (NCI, 1977; NTP, 1986). The chemical also induced mononuclear cell leukemia and renal tubular cell tumors in rats. Tetrachloroethylene was negative for tumor initiation in a dermal study and for tumor induction in a pulmonary tumor assay (Van Duuren et al., 1979; Theiss et al., 1977).

On the basis of the sufficient evidence from oral and inhalation studies for carcinogenicity in animals and none or inadequate evidence for carcinogenicity to humans, tetrachloroethylene is placed in EPA's weight-of-evidence Group B2, probable human carcinogen (NCI, 1977; NTP, 1986; EPA, 1991). For oral exposure, the slope factor is $5.1 \times 10^{-2} \text{ (mg/kg/day)}^{-1}$; the unit risk is $1.5 \times 10^{-6} \text{ (mg/L)}^{-1}$. For inhalation exposure, the slope factor was not calculated; the unit risk is $5.2 \times 10^{-7} \text{ (mg/m}^3\text{)}^{-1}$.

Human health effects resulting from chronic exposure to various concentrations of tetrachloroethylene include respiratory tract irritation, headache, nausea, sleeplessness, abdominal pains, constipation, cirrhosis of the liver, hepatitis, and nephritis (Coler and Rossmiller, 1953; Stewart et al., 1970; von Ottingen, 1964, Stewart, 1969). In one study, 16 of 25 workers, exposed to 59 to 442 ppm for 2 months to 27 years had significantly elevated SGOT and SGPT activity compared with controls (Chmielewski et al., 1976).

An NTP bioassay provided chronic toxicity data for animals exposed to tetrachloroethylene. Groups of 50 male and 50 female F344/N rats and B6C3F₁ mice inhaled the chemical 6 hours/day, 5 days/week for 103 weeks (NTP, 1986). The exposure concentrations consisted of zero, 200, or 400 ppm for rats and zero, 100, or 200 ppm for mice. In rats, nonneoplastic effects consisted of dose-related renal tubular cell karyomegaly (males and females), renal tubular cell hyperplasia (males only), and dose-related increases in the incidences of nasal thromboses and squamous metaplasia (the thromboses were believed to have been secondary to tetrachloroethylene-induced leukemia). The incidence of renal tubular cell karyomegaly was higher in males than in females. In mice, nonneoplastic effects consisted of dose-related hepatic degeneration, hepatic necrosis, and hepatic nuclear inclusion; dose-related renal tubular cell karyomegaly; and pulmonary congestion.

Pegg et al. (1978), reported in a fate and disposition study that rats inhaling a tetrachloroethylene concentration of 600 ppm (4 g/m^3) 6 hours/day, 5 days/week for 12 months developed unspecified reversible liver damage.

In a Danish study, a cohort of laundry and dry-cleaning workers was studied for cancer incidence among persons exposed to tetrachloroethylene (the most commonly used solvent in Danish dry-cleaning shops) (Lyng and Thygesen, 1990). The 10-year follow-up study evaluated 8,567 women and 2,033 men employed in laundry and dry-cleaning in 1970. The study revealed a significant excess risk for primary liver cancer among the women (7 observed, 2.1 expected); but not one case of primary liver cancer was found among the men, for whom the expected value was 1.1. Although the majority of primary liver cancer cases in Denmark has been associated with excess alcohol consumption, the investigators did not believe this to be the exclusive explanation for the excess tumors among the dry-cleaning workers.

A retrospective mortality epidemiologic study of dry cleaning workers with exposure to tetrachloroethylene reported an excess of mortality from kidney and bladder cancer (8 cases versus 2.7 expected; SMR=296) and cancer of the cervix (10 observed versus 5.1 expected; SMR=296) (Brown and Kaplan, 1985). The cohort consisted of 1,690 workers with ≥ 23 years of employment. The results of this study were inconclusive because the workers had potential occupational exposure to petroleum solvents, in addition to tetrachloroethylene. However, a subcohort of the study, consisting of 615 workers with no known exposure to petroleum solvents, demonstrated no excess risk for cancer at any site (Brown and Kaplan, 1985). Other studies of dry cleaning and laundry workers have demonstrated increases in mortality due to various types of cancer (lung, cervix, kidney, skin and/or colon), but the data are also regarded as inconclusive because of various confounding factors (EPA, 1988).

In a carcinogenicity bioassay, groups of 50 male and 50 female F344/N rats and B6C3F₁ mice inhaled tetrachloroethylene 6 hours/day, 5 days/week for 103 weeks (NTP, 1986). The exposure concentrations were zero, 200, or 400 ppm for rats and zero, 100, or 200 ppm for mice. Exposure to tetrachloroethylene under the conditions of the study resulted in: (a) clear evidence of carcinogenicity for male F344/N rats as shown by an increased incidence of mononuclear cell leukemia (controls, 28/50; low dose, 37/50; high dose, 37/50) and renal tubular cell adenomas or carcinomas combined (1/49, 3/49, 4/50) (the incidence of the renal tumors was not statistically significant, but these uncommon tumors had been found consistently at low incidences in male rats in other studies of chlorinated ethanes and ethylenes); (b) some evidence of carcinogenicity for female rats as shown by increased incidences of mononuclear cell leukemia (18/50, 30/50, 29/50); and (c) clear evidence of carcinogenicity for mice as shown by increased incidences of hepatocellular adenomas (11/49, 8/49, 18/50) and carcinomas (7/49, 25/49, 26/50) in males and of hepatocellular carcinomas (1/48, 13/50, 36/50) in females. There were no neoplastic changes in the respiratory tract of either species, but there was an increased incidence (non-dose-related) of squamous metaplasia in the nasal cavities of treated male rats.

Tumors were not observed in groups of 96 male and 96 female Sprague-Dawley rats exposed to tetrachloroethylene concentrations of 300 or 600 ppm, 6 hours/day, 5 days per week for 52 weeks and observed for the rest of their lives (Rampy et al., 1978).

A.3.3 References

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A.4 Polychlorinated Biphenyls (PCBs)

Toxicity Classification: B2 carcinogens (EPA, 1995)
(Comment: Classification is based on hepatocellular carcinomas in rats and mice, suggestive evidence of excess risk of liver cancer in humans by ingestion, inhalation, and dermal contact.)

Toxicity Criteria:

Reference Dose (RfD)—Oral: 7.0E-5 mg/kg/day (Aroclor-1016)
2.0E-5 mg/kg/day (Aroclor-1254)

Cancer Slope Factor—Oral: 7.7 (mg/kg/day)⁻¹

Cancer Slope Factor—Inhalation: To be determined

Target Organs (primary):

- skin (hyperpigmentation and hyperkeratosis)

A.4.1 General Information

There are four commercial PCB mixtures marketed in the U.S. under the name Aroclor® (Aroclor®1016, 1242, 1254, and 1260) (USAF, 1989). Aroclor® formulations are complex mixtures of PCBs produced by progressive chlorination of biphenyl with anhydrous chlorine, and because they are mixtures, their physical properties and chemical behavior cannot be precisely defined (USAF, 1989). PCBs have been used as heat transfer liquids, hydraulic fluids, lubricants, plasticizers, surface coatings, inks, adhesives, pesticide and extenders, and for microencapsulation of dyes for carbonless duplicating paper (USAF, 1989).

The environmental behavior of the Aroclor® mixtures is a direct function of their relative composition with respect to the individual PCB species (USAF, 1989). Individual PCBs vary widely in their physical and chemical properties according to the degree of chlorination and position of the chlorines on the biphenyl structure. In general, as chlorine content increases, adsorption increases while transport and transformation processes decrease (USAF, 1989).

Because of their very low solubility in water ($\sim 2.70 \times 10^{-3}$ mg/L at 20°C), high log octanol-water partitioning coefficients (K_{ow}) of 6.1 to 9.3, and extremely high organic carbon partition coefficients (K_{oc}) of 100,000 to 1,000,000,000, adsorption to soils and sediments is the major fate process affecting PCBs in the environment, particularly in soils with high organic carbon content (USAF, 1989). As a result, PCBs are expected to be highly immobile in the soil, and leaching to the groundwater system is unlikely. However, in the presence of organic solvents, PCBs are found to be highly mobile in the soil despite the high percent retained by the organic carbon present (USAF, 1989).

Transport of PCB vapors through the air-filled pores of unsaturated soils is not expected to be a rapid transport pathway. Volatilization (mostly from aqueous systems) followed by atmospheric transport is expected to be slow, but may be a significant long-term transport process and is thought to account for the widespread, almost ubiquitous, distribution of PCBs in the environment. PCBs have been reported to be strongly resistant to chemical degradation by oxidation or hydrolysis; however, PCBs have been shown to be susceptible to slow-rate photolytic and biological degradation. Highly chlorinated PCBs can be photolytically degraded, resulting in the formation of lower chlorinated species and substituted products, as well as potential formation of biphenylenes and chlorinated dibenzofurans. The presence of oxygen retards the photolytic degradation of PCBs (USAF, 1989).

Microbial degradation has been reported to be an important transformation process for PCBs to include both aerobic oxidative and anaerobic dechlorination biodegradation. In general, the less chlorinated PCBs were more easily degraded than the more chlorinated species. However, the presence of the lower chlorinated biphenyls has been shown to increase the rate of biodegradation of the more chlorinated PCBs through co-metabolism (USAF, 1989).

The high bioconcentration factor combined with the persistence of PCBs suggests that these compounds bioaccumulate and can be biomagnified (EPA, 1979b).

A.4.2 Basis for Toxicity Criteria

A.4.2.1 *Non-carcinogenic Effects*

EPA currently has not established an RfD/RfC for the noncarcinogenic effects of oral or inhalation exposures to PCBs (IRIS, 1995; HEAST, 1994). Because PCBs are slowly metabolized compounds, toxic symptoms of noncarcinogenic effects usually occur after long-term exposure and bioaccumulation. Initial symptoms of PCB poisoning are non-specific, such as loss or reduced weight gain, while more severe poisoning in rats have resulted in ataxia, diarrhea, lack of response to pain stimuli; and histopathological changes primarily in the liver and kidney (USAF, 1989). In humans exposed to PCBs in the workplace, reported adverse effects include chloracne (a long-lasting, disfiguring skin disease), impairment of liver function, neurobehavioral disorders, menstrual disorders, and minor birth abnormalities (ATSDR, 1988b; EPA, 1985b). Animals experimentally exposed to PCBs have shown most of the same symptoms as well as impaired reproduction and fetotoxicity; pathological changes in the liver, stomach, skin, spleen, lymph nodes, and thymus; and suppression of the immunological system (ATSDR, 1988b; EPA, 1985b; and USAF, 1989).

PCBs are almost completely absorbed from the digestive tract (>90 percent) with subsequent distribution to the liver and muscle tissue, followed by redistribution to body fat, skin, and other fat-containing organs (ATSDR, 1988b). Absorption via the skin is also fairly efficient, as indicated by occupational exposures where effects of PCB exposure can be detected even at doses too low to produce pathologic effects (ATSDR, 1988b).

A.4.2.2 *Carcinogenicity*

On the basis of the increased incidence of liver tumors following dietary exposure of rats to Aroclor® (Norback and Weltman, 1985), PCBs have been classified by EPA as B2 carcinogens (IRIS, 1995) for both the oral and inhalation routes of exposure. A classification of B2 indicates that sufficient evidence exist to show carcinogenicity in animals, but inadequate evidence of carcinogenicity in humans. Based on a statistically significant increase in the occurrence of liver tumors following oral exposure, EPA (IRIS, 1995) has developed an oral cancer potency slope factor of $7.7 \text{ (mg/kg/day)}^{-1}$ for PCBs; a CPF has not yet been determined for the inhalation route of exposure (IRIS, 1992; HEAST, 1992).

A.4.3 Standards And Criteria

EPA has promulgated the enforceable (for public water supplies) maximum contaminant level (MCL) of 0.0005 mg/L for PCBs, based on a practical quantitation limit (PQL) of 0.0005 mg/L, which is associated with a maximum lifetime individual risk of 1×10^{-4} . EPA has also proposed an MCL Goal (MCLG) of zero mg/L PCBs based on the evidence of carcinogenic potential (classification group B2) (IRIS, 1995).

EPA has also established ambient water quality criterion (AWQC) for human consumption of water and aquatic organisms contaminated with PCBs at $7.9 \times 10^{-5} \text{ ug/L}$ (IRIS, 1995). An AWQC of $7.9 \times 10^{-6} \text{ ug/L}$ has also been set for the consumption of aquatic organisms alone

(IRIS, 1995). The proposed federal AWQC for the protection of aquatic life are 2.0 mg/L (acute) and 0.014 mg/L (chronic) (IRIS, 1992).

A.4.4 References

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Table PCB-2
Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Organism, Compound Tested	Exposure Period (days)	LC50 (µg/L)	Reference*
Invertebrates			
<u>Orconectes nais</u> (Crayfish)			
1242	7	30	NAS, 1979
1254	7	80 to 100	NAS, 1979
<u>Gammarus pseudolimnaeus</u> (Scud)			
1242	4	10	NAS, 1979
1242	10	5	NAS, 1979
1248	4	52	NAS, 1979
1254	4	2,400	NAS, 1979
<u>Palaemonetes kadiakensis</u> (Glass shrimp)			
1254	7	3	NAS, 1979
<u>Ischnura verticalis</u> (Damselfly)			
1242	4	400	Johnson and Finley, 1980
1254	4	200	Johnson and Finley, 1980
<u>Macromia</u> sp (Dragonfly)			
1242	4	800	Johnson and Finley, 1980
1254	5	800	Johnson and Finley, 1980
<u>Daphnia magna</u> (Cladoceran)			
1254	14	18 to 240	EPA, 1980c
1254	21	1.3	EPA, 1980c
<u>Pteronarcella badia</u> (Stonefly)			
1016	4	424 to 878	Johnson and Finley, 1980
<u>Hydra oligactis</u> (Hydra)			
1016	3	5,000	Adams and Haileselassie, 1984

Table PCB-2
Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Page 2 of 3

Organism, Compound Tested	Exposure		Reference*
	Period (days)	LC50 (µg/L)	
1254	3	10,000	Adams and Harleselassie, 1984
Fish			
<u>Oncorhynchus mykiss</u> (Rainbow trout)			
1016	4	114 to 159	Johnson and Finley, 1980
1242	5	67	Johnson and Finley, 1980
1248	5	54	Johnson and Finley, 1980
1254	5	142	Johnson and Finley, 1980
1254	10	8	NAS, 1979
1260	20	21	NAS, 1979
<u>Lepomis macrochirus</u> (Bluegill)			
1016	4	390 to 540	Johnson and Finley, 1980
1242	5	125	Johnson and Finley, 1980
1242	15	54	NAS, 1979
1248	20	10	NAS, 1979
1254	25	54	NAS, 1979
1260	30	150	NAS, 1979
<u>Ictalurus punctatus</u> (Channel catfish)			
1016	4	340 to 560	Johnson and Finley, 1980
1242	15	110	NAS, 1979
1248	15	130	NAS, 1979
1254	15	740	NAS, 1979
1260	30	140	NAS, 1979
Salmonids, 4 spp.			
1016	4	134 to 1,154	Johnson and Finley, 1980
Catostomids, 2 spp.			
1016	4	222 to 582	Johnson and Finley, 1980

Table PCB-2
Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Organism, Compound Tested	Exposure Period (days)	LC50 (µg/L)	Reference*
Fish, cont'd			
<u>Salmo clarki</u> (Cutthroat trout)			
1221	4	1,170	Johnson and Finley, 1980
1232	4	2,500	Johnson and Finley, 1980
1242	4	5,420	Johnson and Finley, 1980
1248	4	5,750	Johnson and Finley, 1980
1254	4	42,500	Johnson and Finley, 1980
1260	4	60,900	Johnson and Finley, 1980
1262	4	>50,000	Johnson and Finley, 1980
1268	4	>50,000	Johnson and Finley, 1980
<u>Perca flavescens</u> (Yellow perch)			
1016	4	240	Johnson and Finley, 1980
1242	4	>150	Johnson and Finley, 1980
1248	4	>100	Johnson and Finley, 1980
1254	4	>150	Johnson and Finley, 1980
1260	4	>200	Johnson and Finley, 1980

*References cited are from USFWS, 1986b.

Table PCB-1
Effects of PCBs on Aquatic Plants

Species	Chemical	Duration	Effect	Result (mg/L)	Reference*
<u>Euglena gracilis</u> (Alga)	Aroclor® 1221	48 hrs	LD50	4,400	Ewald <i>et al.</i> , 1976
<u>Euglena gracilis</u> (Alga)	Aroclor® 1242	8 days	Reduced growth	10,000	Bryan and Olafsson, 1978
<u>Scenedesmus obtusiusculus</u> (Alga)	Aroclor® 1242	24 hrs	Growth inhibition	300	Larsson and Tillberg, 1975
<u>Scenedesmus quadricauda</u> (Alga)	Aroclor® 1254	24 hrs	Reduction in rate of carbon fixation	0.1	Laird, 1973
<u>Chlorella pyrenoidosa</u> (Alga)	Aroclor® 1268	191 hrs	Depressed cell productivity	1,000	Hawes <i>et al.</i> , 1976
<u>Chlorella pyrenoidosa</u> (Alga)	Aroclor® 1254	73 hrs	Reduced population growth	1,000	Hawes <i>et al.</i> , 1976
<u>Chlamydomonas reinhardtii</u> (Alga)	Aroclor® 1242	22 days	Reduced growth	2,000	Morgan, 1972
<u>Phormidium</u> sp (Alga)	Dichlorobiphenyl	3 hrs	Reduced motility	50	Zullei and Benecke, 1978

*References cited are from EPA, 1980c

Table PCB-4
BCFs for Aroclor® PCBs

Species	Tissue	BCF	Duration (days)	Reference*
<u>Daphnia magna</u> (Cladoceran) 1254	Whole body	3,800	4	Mayer et al., 1977
<u>Gammarus pseudolimnaeus</u> (Scud) 1248	Whole body	108,000	60	Nebeker and Puglisi, 1974
<u>Chaoborus punctipennis</u> (Phantom midge) 1254	Whole body	2,700	14	Mayer et al., 1977
<u>Pimephales promelas</u> (Fathead minnow) (female) 1248 1260 1242	Whole body Whole body Whole body	120,000 270,000 274,000	240 240 255	DeFoe et al., 1978 DeFoe et al., 1978 Nebeker et al., 1974
<u>Lepomis macrochirus</u> (Bluegill) 1248	Whole body	52,000	77	Stalling, 1971
<u>Ictalurus punctatus</u> (Channel catfish) 1248	Whole body	56,400	77	Mayer et al., 1977

*References cited are from EPA (1980c)

A.5 Trichloroethene

Toxicity Classification:

Classification B2: Probable human carcinogen (EPA, 1990)

Toxicity Criteria:

Reference dose (RfD)–Oral: 6E-3 mg/kg/day (provisional value)

Uncertainty/modifying factor: N/A

Cancer Slope Factor–Oral: 1.1E-2 (mg/kg/day)⁻¹ (provisional value)
(Withdrawn from IRIS, pending review)

Cancer Slope Factor–Inhalation: 6E-3 (mg/kg/day)⁻¹ (provisional value)

Target Organs:

- Nervous system: CNS symptoms in workers exposed to TCE by inhalation included headache, sleepiness, vision distortion, nausea, abnormal reflexes, tremors, ataxia, nystagmus, and increased respiration.
- Liver: After inhalation exposure to TCE, rodents developed enlarged livers and biochemical changes indicative of liver damage. Liver damage in humans is primarily associated with acute exposure to TCE. The hepatotoxic effects of TCE are enhanced by concomitant exposure to alcohol.
- Kidney: Rats developed renal cytotubularomegaly after chronic inhalation exposure to TCE.
- Cardiovascular system: Occupational exposure to TCE has been associated with vasomotor changes, tachycardia, bradycardia, extrasystoles, conduction disturbances, and precordial pain. TCE sensitizes the heart to cardiac arrhythmias.
- Hematopoietic system: Inhalation of TCE induced myelotoxic anemia in rabbits and produced dose-related changes in several hematological indices in rats.
- Reproduction: Inhalation studies with rodents indicate that TCE may cause increased resorptions, reduced fetal body weight, and ossification anomalies. Exposure to high concentrations produced sperm abnormalities in mice.
- Skin: Reddening of the skin after mechanical or heat insults and dermographism was seen in workers exposed to TCE by inhalation.

A.5.1 General Information

Trichloroethene is widely used as an industrial solvent, particularly in metal degreasing (USAF, 1989). It is also used in a variety of miscellaneous applications such as a low-temperature heat exchange fluid, as a fumigant, as a diluent in paints and adhesives, in aerospace operations to flush liquid oxygen, and in textile processing. It was previously used as an extractant in food processing and as an anesthetic, but it is no longer used for these purposes because of possible carcinogenic activity (USAF, 1989).

Trichloroethene is expected to be relatively mobile in the soil/groundwater system as, at 1,000 mg/L at 20°C, it is soluble in water. Trichloroethene has a low soil sorption coefficient (K_{oc}) that, with an estimated value of 127 and a log octanol-water partition coefficient ($\log K_{ow}$) of 2.42, indicates that it will not be strongly bound to soils (USAF, 1989). On the basis of the vapor pressure of 60 torr at 20°C, transport of trichloroethene vapors through the air-filled pores of unsaturated soils, followed by photooxidation, is an important loss mechanism for near-surface contaminated soils (USAF, 1989). Upon reaching the atmosphere from surface waters and soil surfaces, trichloroethene reacts with hydroxyl radicals to produce hydrochloric acid, carbon monoxide, carbon dioxide, and carboxylic acid. In saturated subsurface soils (where soil organic carbon and soil air are negligible), a much higher fraction of the trichloroethene is expected to be present in the soil-water phase and transported with flowing groundwater. Because trichloroethene is a low molecular weight chloroaliphatic, it is not rapidly metabolized in the environment, although it can be degraded by acclimated microbial populations. Under normal environmental conditions, trichloroethene is not expected to undergo rapid hydrolysis (USAF, 1989).

A.5.2 Basis for Toxicity Criteria

EPA (IRIS, 1995; HEAST, 1994) does not provide any RfDs or slope factors (SFs) for trichloroethene. Because a chronic health hazard assessment for noncarcinogenic effects is currently under review by an EPA Work Group, an oral RfD is listed as pending. EPA's Environmental Criteria and Assessment office does provide an interim oral health-based value of 0.006 mg/kg/day. No data are available for developing an inhalation RfD for trichloroethene (IRIS, 1994).

Effects of short-term human exposure include mild eye irritation, nausea, vertigo, headache, and confusion. Unconsciousness and death may occur after exposure to excessive concentrations (ATSDR, 1988). Chronic oral exposure of humans to trichloroethene is characterized by dizziness, nausea, headache, ataxia, decreased appetite, and sleep disturbances (ATSDR, 1988). The acute oral toxicity of trichloroethene is low in animals, as indicated by acute oral LD_{50} values that range from 2,400 mg/kg for a mouse to 7,330 mg/kg for a rabbit (ATSDR, 1988). EPA (1984) reported 18 mg/kg/day as the NOAEL for trichloroethene.

A.5.3 Carcinogenicity

A.5.3.1 Oral Studies

EPA has classified trichloroethene as a group B2 (probable human) carcinogen. This classification indicates that sufficient evidence exists, based on an increased incidence of lung and liver tumors after exposure, to support carcinogenicity in animals, but inadequate evidence exists of carcinogenicity in humans (IRIS, 1992). The results of several mouse bioassays indicated an increased incidence of liver tumors following oral gavage exposure and an increased incidence of lung tumors following inhalation exposure (EPA, 1984). EPA has developed an interim oral slope factor of $0.011 \text{ (mg/kg/day)}^{-1}$ and an interim inhalation slope factor of $0.017 \text{ (mg/kg/day)}^{-1}$. EPA (IRIS, 1991) had listed final slope factor values, but has withdrawn them (IRIS, 1995) pending further review by an EPA Work Group.

Maltoni et al. (1986) treated male and female Sprague-Dawley rats by gavage with TCE (99.9 percent pure) in olive oil at doses of 50 or 250 mg/kg/day, 4 to 5 days/week for 52 weeks. There was a dose-related increase in the incidence of leukemia in males, but no increased tumor incidence in females.

Significantly increased incidences of hepatocellular carcinomas occurred in B6C3F₁ mice that were administered time-weighted-average doses of 1,170 or 1,340 mg/kg/day (males) or 870 or 1,740 mg/kg/day (females) by gavage, 5 days/week for 78 weeks. No compound-related carcinogenic effects were found in Osborne-Mendel rats similarly treated with 550 or 1,100 mg/kg/day, but this finding was inconclusive because of poor survival. The TCE used in the study was ≥ 99 percent pure but contained stabilizers, including epichlorohydrin, a known carcinogen (NCI, 1976).

Studies by NTP (1982, 1986a) showed significantly increased incidences of hepatocellular carcinomas in male and female B6C3F₁ mice treated by gavage with epichlorohydrin-free TCE at a dose of 1,000 mg/kg/day, 5 days/week for 103 weeks. F344 rats treated with 1,000 mg/kg/day by the same regimen exhibited renal adenomas and adenocarcinomas; this effect was not seen at 500 mg/kg/day or in females at either dose level. Due to poor survival, the results in rats were considered inadequate. A third NTP study (NTP, 1988) exposed groups of male and female ACI, August, Marshall, and Osborne-Mendel rats by gavage to epichlorohydrin-free TCE in corn oil at doses of zero, 500, or 1,000 mg/kg, 5 days/week for 103 weeks. There were significantly increased incidences of renal tubular cell neoplasms in low dose male Osborne-Mendel rats and interstitial cell neoplasms of the testis in high-dose Marshall rats. This study also was considered inadequate for the assessment of carcinogenic activity because of toxic nephrosis and low survival.

Henschler et al. (1984) compared the carcinogenicity of TCE stabilized with epichlorohydrin (0.8 percent) or 1,2-epoxybutane (0.8 percent) to that of industrial-grade TCE in male and female ICR/Ha Swiss mice. TCE was administered daily by gavage (2.4 g/kg, females; 1.8

g/kg, males) for 18 months, with and without the addition of the epoxides. Animals exposed to epichlorohydrin- or 1,2-epoxybutane-stabilized TCE exhibited an increased incidence of papillomas and carcinomas of the forestomach. This effect was not observed without stabilizers.

A.5.3.2 Inhalation Exposures

Epidemiologic studies conducted by Axelson et al. (1978), Malek et al. (1979), and Tola et al. (1980) reported no significant excess cancer risks associated with occupational exposure to TCE, but the studies do not permit definite conclusions because of various study limitations such as inadequate latency periods, small sample size, lack of analysis by tumor site, and multiple chemical exposure (ATSDR, 1989; EPA, 1985). An update of one of the studies (Axelson, 1986) found a slight increase of bladder cancer and lymphomas in an expanded cohort study; however, details of TCE exposure were not given. A retrospective cohort mortality study of dry-cleaning and/or laundry workers (Blair et al., 1979) found significant increases in the incidence of cancer at several sites (lung/bronchi/trachea, cervix, and skin) among a group of 330 deceased workers. This cancer increase was possibly due to dry-cleaning chemicals (carbon tetrachloride, tetrachloroethylene, and TCE) but could not be related to TCE alone. Paddle (1983) examined tumor registry records in Great Britain and found no association between liver cancer and TCE exposure in workers employed in one TCE production facility.

Bell et al. (1978) reported no carcinogenic effects in Charles River rats exposed to technical grade TCE at concentrations of zero, 100, 300, or 600 ppm, 6 hours/day, 5 days/week for 24 months. Hepatocellular carcinomas were seen in B6C3F₁ mice similarly exposed to TCE, with a greater incidence of tumors occurring in males than in females. The TCE employed contained 0.148 percent epichlorohydrin and several other additives.

Wistar rats, NMR mice, and Syrian hamsters were exposed to purified TCE at zero, 100, or 500 ppm, 6 hours/day, 5 days/week for 18 months (Henschler et al., 1980). The only statistically significant effect was an increased incidence of malignant lymphomas in female mice. EPA (1987) suggested that lymphoma susceptibility may have been enhanced by virus and immunosuppression.

Fukuda et al. (1983) exposed female ICR mice and Sprague-Dawley rats to reagent-grade TCE (containing 0.019 percent epichlorohydrin) at concentrations of zero, 50, 150, or 450 ppm, 7 hours/day, 5 days/week for 104 weeks. Although there were a number of tumors at several sites in rats and mice, only lung adenocarcinomas were significantly increased in mice at the two highest concentrations, as compared with controls.

Maltoni et al. (1986, 1988) exposed male and female Sprague-Dawley rats, Swiss mice, and B6C3F₁ mice to 100, 300, or 600 ppm epoxide-free TCE, 7 hours/day, 5 days/week for 104 weeks (rats) or 78 weeks (mice). Statistically significant increased incidences of tumors included testicular Leydig cell tumors in rats at 100 ppm, lung adenomas in male Swiss mice at 300 ppm, hepatomas in male Swiss mice at 600 ppm, and lung adenomas in female B6C3F₁ mice at 600 ppm.

A.5.3.3 Teratogenicity/Reproductive Effects

No epidemiological studies of congenital anomalies in children born to women exposed to trichloroethene during pregnancy have been reported (TERIS, 1995).

Developmental toxicity studies with trichloroethene indicate that it is fetotoxic, but is neither mutagenic nor teratogenic to rodents after inhalation exposure; however, one of the potential intermediate metabolites, chloral hydrate, is mutagenic. No fetotoxicity or teratogenicity were reported in pregnant mice and rats exposed to air levels of 300 ppm for 7 hours/day on gestational days 6 through 15. However, anomalies of skeletal and soft tissues indicative of developmental delay were reported in offspring of pregnant rats exposed to high doses.

A.5.4 Standards and Criteria

EPA has promulgated an enforceable (for public water supplies) MCL of 5 mg/L for trichloroethene based on 10X the MDL; it is associated with a maximum lifetime individual risk of 1E-6 (IRIS, 1992). EPA has also promulgated a nonenforceable MCL Goal (MCLG) of zero mg/L based on the potential carcinogenic effects associated with exposure to this Group B2 carcinogen. EPA is currently re-evaluating the carcinogenic ranking for trichloroethene.

EPA has also established ambient water quality criteria (AWQC) for human consumption of water and aquatic organisms (W + F) of 2.7 mg/L and for human consumption of aquatic organisms alone (F) of 80.7 mg/L (IRIS, 1992). These AWQC would yield a value for human consumption of water alone (W) of 2.8 mg/L based on the following formula:

$$\frac{I}{W + F} = \frac{I}{W} + \frac{I}{F}$$

A.5.5 References

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A.6 *cis*- and *trans*-1,2-Dichloroethene

Toxicity Classification:

EPA: Group D (not classifiable as a carcinogen)

Toxicity Criteria:

Reference Dose (RfD)–Oral: 1E-2 mg/kg/day (EPA, 1990b) (*cis* 1,2-DCE)

Uncertainty/modifying factor: 3,000

trans-1,2-Dichloroethene

Oral RfD: 2E-2 mg/kg/day (EPA, 1990a,b)

Uncertainty Factor: 1,000

Modifying Factor: 1

NOAEL: 0.1 mg/L (17 mg/kg/day)

LOAEL: 1 mg/L (175 mg/kg/day)

Target Organs:

- liver
- nervous system
- eyes
- heart
- liver
- lungs

A.6.1 General Information

1,2-dichloroethene exists in two isomeric forms: *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene, that are colorless, volatile liquids with a slightly acrid odor. Although not used extensively in industry, 1,2-dichloroethene is used in the production of other chlorinated solvents and as a solvent for dyes, perfumes and lacquers. Humans are exposed to 1,2-dichloroethene primarily by inhalation, but exposure can also occur by oral and dermal routes.

Limited information exists about the absorption, distribution, and excretion of 1,2-dichloroethene in either humans or animals. *In vitro* studies have shown that the mixed function oxidases will metabolize 1,2-dichloroethene; the final metabolic products being dependent on the initial isomer of 1,2-dichloroethene.

Information about the toxicity of 1,2-dichloroethene in humans and animals is limited. Workers acutely exposed to 1,2-dichloroethene have been reported to suffer from drowsiness, dizziness, nausea, fatigue, and eye irritation (ATSDR, 1990). Acute and subchronic oral and inhalation studies of *trans*-1,2-dichloroethene and acute inhalation studies of *cis*-1,2-dichloroethene indicate that the liver is the primary target organ in animals; toxicity being expressed by increased activities of liver associated enzymes, fatty degeneration, and necrosis (McCauley et al., n.d.; Barnes et al., 1985). Secondary target organs include the central nervous system and lungs.

A.6.2 Basis for Toxicity Criteria

On the basis of an unpublished study describing decreased hemoglobin and hematocrits in rats treated by gavage for 90 days, EPA (1990a,b) assigned a subchronic and chronic oral RfD for *cis*-1,2-dichloroethene of 1E-1 mg/kg/day and 1E-2 mg/kg/day, respectively. The RfDs were derived from NOAEL/LOAEL of 32 mg/kg/day. No inhalation reference concentration (RfC) for *cis*-1,2-dichloroethene has been derived.

Subchronic and chronic RfDs of 2E-1 mg/kg/day and 2E-2 mg/kg/day, respectively, for *trans*-1,2-dichloroethene have been calculated. The RfDs were derived from a LOAEL of 175 mg/kg/day based on the increase of serum alkaline phosphatase activity in mice that received *trans*-1,2-dichloroethene in their drinking water (EPA, 1990a,b). No RfC for *trans*-1,2-dichloroethene has been derived.

No information was available concerning the chronic, developmental or reproductive toxicity of *cis*-1,2-dichloroethene or *trans*-1,2-dichloroethene. No cancer bioassays or epidemiological studies were available to assess the carcinogenicity of 1,2-dichloroethene. EPA (1990a,b) has placed *cis*-1,2-dichloroethene in weight-of-evidence group D; not classifiable as to human carcinogenicity, based on the lack of human or animal carcinogenicity data and on essentially negative mutagenicity data. *trans*-1,2-dichloroethene has not been classified.

Freundt et al. (1977) reported that groups of six adult female Wistar rats exposed to *trans*-1,2-dichloroethene at concentrations of 200, 1,000, or 3,000 ppm for 8 hours or to 200 ppm 5 days/week for 1 or 2 weeks developed fat accumulation in the hepatocytes and Kupffer cells of the liver and capillary hyperemia of the lung. Rats exposed to 1,000 ppm *trans*-1,2-dichloroethene for 8 hours had significantly decreased ($p < 0.05$) serum concentrations of albumin and urea nitrogen and decreased alkaline phosphatase activity. These results are of questionable biological significance because none were outside the established normal range for the species. In addition, rats exposed to 3,000 ppm *trans*-1,2-dichloroethene developed fibrous swelling and hyperemia of the cardiac muscle.

Freundt and Macholz (1978) reported the results of studies in which adult female SPF Wistar rats were exposed for 8 hours to concentrations of zero, 200, 600, 1,000, or 3,000 ppm *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene. Although the inhalation treatment of rats with either isomer of 1,2-dichloroethene produced a significant ($p < 0.05$) and dose-dependent increase in the hexobarbital sleeping time and zoxazolamine paralysis time, the effects

produced by *cis*-1,2-dichloroethene were greater than those of *trans*-1,2-dichloroethene. In addition, both isomers of 1,2-dichloroethene produced a significant ($p < 0.05$) and dose-dependent reversible inhibition in the formation of free aminoantipyrine. Freundt and Macholz (1978) also reported that the addition of 1,000 ppm *trans*-1,2-dichloroethene to rat microsomes competitively inhibited the N-demethylation of aminopyrine and the O-demethylation of *p*-nitroanisole.

A.6.3 References

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A.7 1,1,1-Trichloroethane

Toxicity Classification:

EPA's weight-of-evidence group D, "not classifiable as to human carcinogenicity" (EPA, 1990).

Toxicity Criteria:

Reference dose (RfD)—Oral:	0.035 mg/kg/day
Uncertainty Factor:	1,000
NOAEL:	500 ppm

(Comment: Value based on the hepatotoxicity observed in a 6-month inhalation study in the guinea pig by Torkelson et al. (1958). The Torkelson et al. (1958) study provided a NOAEL of 500 ppm that was converted to 90 mg/kg/day (EPA, 1991). Uncertainty factors of 10 each were employed for use of a subchronic assay, for extrapolation from animal data, and for protection of sensitive human subpopulations. The oral RfD is withdrawn from IRIS (EPA, 1995).)

Reference Dose (RfD)–Inhalation: 2.86E-1 mg/kg/day

Inhalation RfC: 1 $\mu\text{g}/\text{m}^3$ (0.3 g/kg/day)

Uncertainty Factor: 1,000

NOAEL: 500 ppm

(Comment: Value cited in EPA (1991). Uncertainty factors of 10 each were employed for use of a subchronic assay, for extrapolation from animal data, and for protection of sensitive human subpopulations. This value has been withdrawn from IRIS (EPA, 1995).)

Target Organs:

- Liver: Increased bilirubin levels, observed in one individual following accidental ingestion of 1,1,1-trichloroethane, is the main available evidence for hepatotoxicity of the chemical following oral exposure.
- Central nervous system: Anesthesia is one of the main effects of 1,1,1-trichloroethane administered orally to animals, resulting in death at high doses.

A.7.1 General Information

1,1,1-trichloroethane (methyl chloroform) (CAS No. 71-55-6) has a typical sweetish odor that may be noticeable at concentrations near 100 ppm, significantly less than those that cause toxic response. At 1,000 ppm, the odor is not unpleasant enough to discourage exposure, but at 1,500 and 2,000 ppm, the odor has been described as strong and unpleasant (Torkelson and Rowe, 1981). 1,1,1-trichloroethane has a molecular weight of 133.42, a specific gravity of 1.3249 (26/4°C), and a vapor pressure of 127 torr at 25°C (Torkelson and Rowe, 1981). It is soluble in acetone, benzene, carbon tetrachloride, methanol, and ether, but is insoluble in water (Budavari et al., 1989).

The 1989 use pattern for 1,1,1-trichloroethane is as follows: vapor degreasing (34 percent), cold cleaning (12 percent), aerosols (10 percent), adhesives (8 percent), intermediate (7 percent), coatings (5 percent), electronics (4 percent), other (5 percent), and exports (15 percent) (Chem. Mark. Rep., 1989).

Both OSHA (1989) and ACGIH (1990) have established time-weighted averages (TWAs) of 350 ppm for 1,1,1-trichloroethane. The ACGIH short-term exposure limit (STEL) is 450 ppm. In 1989, the Chemical Marketing Reporter (1989) noted that the chemical was under study by EPA as a possible threat to the ozone layer.

1,1,1-trichloroethane is absorbed via inhalation, oral, and dermal exposure routes (ATSDR, 1990). After cessation of exposure, clearance of the chemical from the blood is rapid—60 to 80 percent is eliminated within 2 hours, and more than 95 percent is eliminated within 50 hours. A large fraction of the absorbed dose is excreted unchanged in exhaled air, regardless of route of exposure (Torkelson and Rowe, 1981). Humans metabolize less than 10 percent of the inhaled dose of 1,1,1-trichloroethane; the major urinary metabolites are trichloroethanol and its glucuronide conjugate, trichloroacetic acid, and volatile carbon dioxide (ATSDR, 1990; Nolan et al., 1984).

A.7.2 Basis for Toxicity Criteria

In both humans and animals, the first and primary response to acute, high concentrations of inhaled 1,1,1-trichloroethane is central nervous system (CNS) depression. The chemical also can sensitize the heart to epinephrine at high levels, but has little effect on other organs. Accidental exposures to concentrations ranging from 6,000 to 70,000 ppm have been fatal to humans (ATSDR, 1990; Torkelson and Rowe, 1981).

The effects of subchronic and chronic inhalation exposure to 1,1,1-trichloroethane are generally mild, characterized by growth reduction in guinea pigs (650 ppm), and minimal hepatic effects in mice (247 ppm, continuous exposure) and rats (1,500 ppm, intermittent exposure). Fatty liver in humans has been associated with exposure to 1,1,1-trichloroethane.

Subchronic and chronic oral RfD values for 1,1,1-trichloroethane are 0.9 mg/kg/day and 0.09 mg/kg/day, respectively (Torkelson et al., 1958; EPA, 1991), subchronic and chronic inhalation RfC values for the chemical are 10 mg/m³ (3 mg/kg/day) and 1 mg/m³ (0.3 mg/kg/day), respectively (Torkelson et al., 1958, EPA, 1991).

Oral bioassays were inconclusive regarding the carcinogenicity of 1,1,1-trichloroethane, and inhalation studies were negative (NCI, 1977; Maltoni et al., 1986). No epidemiological data for 1,1,1-trichloroethane and inadequate carcinogenicity data for animals place the chemical in EPA's weight-of-evidence group D, "not classifiable as to human carcinogenicity" (EPA, 1990).

A.7.2.1 Oral Exposures

Information about the chronic oral toxicity of 1,1,1-trichloroethane in humans was not available. In an NCI bioassay (NCI, 1977), Osborne-Mendel rats were treated by gavage with 750 or 1,500 mg of 1,1,1-trichloroethane/kg body weight in corn oil 5 days a week for 78 weeks. The only adverse effects observed in the rats were decreased body weights at both doses and more severe signs of aging in treated versus control animals. In the same bioassay, B6C3F₁ male and female mice given TWA doses of 2,500 or 4,011 mg/kg/day 5 days/week

for 78 weeks exhibited a reduced body weight gain, and female mice had a dose-related decrease in survival. In an analysis of this study, ATSDR (1990) identified the higher doses for both rats and mice as NOAELs for respiratory, cardiovascular, gastrointestinal, hematological, musculo-skeletal, hepatic, dermatological, immunological, and reproductive effects.

A.7.2.2 Inhalation Exposures

Intentional and accidental inhalation of 1,1,1-trichloroethane has resulted in human fatalities, as reported in several case studies (Hall and Hine, 1966; MacDougall et al., 1987; Stahl et al., 1969). Estimations for fatal exposure concentrations range from 6,000 to 70,000 ppm (ATSDR, 1990). Death has been attributed to either depression of the central nervous system (CNS), resulting in respiratory arrest, or sensitization of the heart to epinephrine, resulting in cardiac arrhythmia. A 15-year-old boy who sniffed typing eraser fluid containing 1,1,1-trichloroethane had complained of double vision and hallucinations before he collapsed and died. Autopsy revealed a grossly edematous brain, edema of the lungs, liver and gut, and tonsillar herniation. Levels of 1,1,1-trichloroethane in the blood were 1.7 ng/mL (1.7 ppb). Levels of 1,1,1-trichloroethane in the blood of three other victims of fatal intoxication (ingested or inhaled) were estimated at 60, 62, and 120 ppm.

In one study, a NOAEL of 370 ppm was defined for Long-Evans and Sprague-Dawley rats, Hartley guinea pigs, squirrel monkeys, New Zealand rabbits, and beagle dogs exposed continuously to 1,1,1-trichloroethane concentrations of 135 or 370 ppm for 90 days (EPA, 1982). In another study, the following species were exposed to 1,1,1-trichloroethane 7 hours/day, 5 days/week for approximately 1 to 3 months: guinea pigs (650, 1,500, 3,000, or 5,000 ppm), rats (5,000 or 3,000 ppm); rabbits (5,000 ppm); and monkeys (3,000 ppm). Body weights, relative organ weights, and BUN levels were measured and histopathological examinations were performed on selected major organs. Rats were unaffected by exposure; rabbits showed slight retardation of growth at 5,000 ppm; and guinea pigs had "slight" liver degeneration at 3,000 ppm, "slight to moderate" degeneration at 5,000 ppm, testicular degeneration at 5,000 ppm, and slight, but significantly reduced growth rates at all exposure levels. The LOAEL for guinea pigs in this study was 650 ppm.

Torkelson et al. (1958) exposed rats, rabbits, guinea pigs, and monkeys to 1,1,1-trichloroethane concentrations of 500, 1,000, 2,000, or 10,000 ppm 7 hours/day, 5 days/week for 6 months. Growth rate, general appearance, mortality, hematology, organ weights and gross and microscopic pathology were evaluated. The female guinea pig was the most sensitive species. At 1,000 ppm, the female guinea pigs had fatty changes in the liver and statistically significant increases in liver weights. The NOAEL for the guinea pigs of this study was 500 ppm.

In an occupational exposure study, cardiovascular and hepatic functions were unaffected in employees exposed to 1,1,1-trichloroethane at an 8-hour TWA of 4 to 217 ppm for approximately 6 years (Kramer et al., 1976).

A.7.2.3 Carcinogenicity

Two oral carcinogenicity assays in animals were found. The NCI (1977) tested technical grade 1,1,1-trichloroethane in Osborne-Mendel rats. Fifty rats were given doses of 750 or 1,500 mg/kg/day, by gavage, 5 days/week for 78 weeks. The controls were untreated. An observation

period of 32 weeks followed. Treated males and females exhibited early mortality with a statistically significant dose-related trend ($P < 0.04$). A variety of neoplasms was observed in both treated and matched control rats, but these were common to aged rats and were not dose-related. The investigators suggested that the low survival of rats of both sexes possibly precluded the detection of tumors late in life. The NCI (1977) also treated B6C3F₁ mice with time weighted average doses of 2,807 or 5615 mg 1,1,1-trichloroethane/kg/day, by gavage, 5 days/week for 78 weeks. An observation period of 12 weeks followed. A variety of neoplasms were observed in both treated and control groups, but only 25 to 45 percent of the treated animals survived until terminal sacrifice. Because of the high early mortality in both species, the investigators did not consider this study to be an adequate test of carcinogenicity.

Maltoni et al. (1986) conducted a carcinogenicity screening study in rats, using only one dose, a small sample size, and no statistical analyses. The animals received 500 mg/kg/day for 104 weeks and were examined for the induction of leukemia. An increase in the total incidence of "leukemias" (13 in treated rats and 4 in vehicle controls) was observed. The biological and statistical significance of these data were not clear. The investigators, unable to draw definite conclusions from these data because of limitations in experimental design, suggested that further carcinogenicity studies were needed.

A.7.3 References

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February 2, 2000

Ted Simon
Region IV

ASSISTANCE REQUESTED: Requested toxicity information on 1,1,2,2-tetrachloroethane. (*Defense Depot Memphis*)

ENCLOSED INFORMATION: Attachment 1: **Risk Assessment Issue Paper for: Evaluation Cancer Assessment for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

Attachment 2: **Risk Assessment Issue Paper for: Evaluation of a Provisional RfC for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

Attachment 3: **Risk Assessment Issue Paper for: Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

BE ADVISED: It is to be noted that the attached Risk Assessment Issue Papers have not been through the U.S. EPA's formal review process. Therefore, they do not represent a U.S. EPA verified assessment. If you have any questions regarding this information, please contact the STSC at (513) 569-7300.

Attachments

**Risk Assessment Issue Paper for: Evaluation
Cancer Assessment for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

INTRODUCTION

A cancer assessment for 1,1,2,2-tetrachloroethane is currently available on IRIS (U.S. EPA, 1997). Based on the lack of human carcinogenicity data and the finding of increased incidences of hepatocellular carcinomas in male and female mice, U.S. EPA considered 1,1,2,2-tetrachloroethane a possible human carcinogen, weight-of-evidence category Group C (U.S. EPA, 1986). NCI (1978) found significant dose-related increases in the incidence of hepatocellular carcinomas in groups of 50 male and 50 female B6C3F1 mice exposed to 142 or 282 mg/kg-day 1,1,2,2-tetrachloroethane in corn oil administered via gavage 5 days/week for 78 weeks followed by a 32-week observation period. NCI (1978) did not find any significant increases in the incidence of neoplasms in Osborne Mendel rats similarly exposed to 62 or 108 mg/kg-day (males) or 43 and 76 mg/kg-day (females). Using the results of the mouse NCI (1978) study, U.S. EPA (1997) derived an oral slope factor of $2.0E-1$ per (mg/kg-day) and an inhalation unit risk of $5.8E-5$ per ($\mu\text{g}/\text{m}^3$).

The cancer weight-of-evidence classification, oral slope factor, and inhalation unit risk were verified by the CRAVE Work Group in June 1986 (U.S. EPA, 1995). To determine if studies published after 1986 would impact the current cancer risk assessment, a recent ATSDR toxicological profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996) and a literature search of the following databases: TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were reviewed.

Data on the carcinogenicity of 1,1,2,2-tetrachloroethane published after 1986 are limited to several genotoxicity studies; none of these studies would impact the current cancer assessment.

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**Risk Assessment Issue Paper for:
Evaluation of a Provisional RfC for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

INTRODUCTION

An RfC for 1,1,2,2-tetrachloroethane is not available on IRIS (U.S. EPA, 1997) or HEAST (U.S. EPA, 1997). ATSDR (1996) has derived an intermediate inhalation minimal risk level (MRL) of 0.4 ppm for 1,1,2,2-tetrachloroethane. This MRL is based on an increase in relative liver weight and signs of hyperplasia, granulation, and cell vacuolization in the livers of rats exposed to 130 ppm 1,1,2,2-tetrachloroethane 5 days/week, 5-6 hours/day for 15 weeks (Truffert et al., 1977). ACGIH (1997) adopted a TWA TLV of 1 ppm with a skin notation for 1,1,2,2-tetrachloroethane; the NIOSH (1997) REL is also 1 ppm with a skin notation. The current enforceable OSHA PEL is 5 ppm with a skin notation (OSHA, 1997).

The most recent document on 1,1,2,2-tetrachloroethane listed in the CARA database (U.S. EPA, 1991, 1994) is a HEA (U.S. EPA, 1984). This HEA, the Toxicological Profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996), and a literature search of the following databases (conducted in November 1997): TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were used to identify relevant data for the derivation of a provisional RfC for 1,1,2,2-tetrachloroethane.

REVIEW OF PERTINENT LITERATURE

The toxicity of 1,1,2,2-tetrachloroethane was first reported in workers applying 1,1,2,2-tetrachloroethane to cloth airplane wings during World War I (as reviewed by NIOSH, 1976). The primary effects observed in these workers included symptoms of liver damage (jaundice, enlarged livers), gastrointestinal disturbances (anorexia, nausea), and neurological effects (hand tremors, headaches, reduced patellar reflexes, paresthesias in the extremities, and sensations of deafness). Exposure concentrations were not reported and it is likely that the workers were also dermally-exposed to 1,1,2,2-tetrachloroethane.

Lobo-Mendonca (1963) observed a number of adverse health effects in a group of 380 workers at 23 Indian bangle manufacturing facilities (80% of workers employed at these facilities were examined). In addition to the inhalation exposure, approximately 50% of the examined workers had a substantial amount of dermal exposure to the 1,1,2,2-tetrachloroethane. Some of the workers were exposed to a mixture of equal parts acetone and 1,1,2,2-tetrachloroethane. Air samples were collected at several work areas in seven facilities. Levels of 1,1,2,2-tetrachloroethane ranged from 9.1 to 98.00 ppm (1-14 mg/m³). High incidences of a number of effects were reported including anemia (33.7%), loss of appetite (22.6%), abdominal pain (23.7%), headaches (26.6%), vertigo (30.5%), and tremors (35%). The significance of these effects can not be

determined because a control group of unexposed workers was not examined. Lobo-Mendonca (1963) noted that the incidence of tremors appeared to be directly related to 1,1,2,2-tetrachloroethane exposure concentrations.

Over a three-year period, Jeney et al. (1957) examined 34-75 workers employed at a penicillin production facility. 1,1,2,2-Tetrachloroethane was used as an emulsifier and wide fluctuations in atmospheric levels occurred throughout the day. The investigators noted that the workers were only in the areas with high 1,1,2,2-tetrachloroethane concentrations for short periods of time and gauze masks with organic solvent filters were worn in these areas. During the first year of the study, 1,1,2,2-tetrachloroethane levels ranged from 0.016 to 1.7 mg/L (16-1700 mg/m³; 2-248 ppm). In the second year of the study, ventilation in the work room was improved and 1,1,2,2-tetrachloroethane levels ranged from 0.01 to 0.85 mg/L (10-850 mg/m³; 1-124 ppm). In the third year of the study, the workers were transferred to a newly built facility; 1,1,2,2-tetrachloroethane levels in the new facility ranged from 0.01 to 0.25 mg/L (10-250 mg/m³; 1-36 ppm). At 2-month intervals, the workers received a general physical examination, and blood was drawn for measurement of hematological parameters, serum bilirubin levels, and liver function tests; urinary hippuric acid levels were measured every 6 months. It appears that workers with positive signs of liver damage were transferred to other areas of the facility and were not examined further. In the first year of the study, 31% of the examined workers had "general or gastrointestinal symptoms." Loss of appetite, bad taste in the mouth, epigastric pain, and a "dull straining pressure feeling in the area of the liver" was reported by 66% of the workers (presumably this is 66% of the workers with symptoms). Other symptoms included headaches, general weakness, and fatigue in 29%, severe weight loss in 4%, and "tormenting itching" in 1%. Enlargement of the liver was observed in 38% of the screened workers. Urobilinogenuria was detected in 50% of the workers; 31% of the workers with urobilinogenuria also had palpable livers. In the second year of the study, there was a decline in the number of symptomatic workers (13% of examined workers) and in workers with positive urobilinogenuria findings (24%). Liver enlargement was observed in 20% of the examined workers. In the third year, the number of workers reporting symptoms decreased to 2% and positive urobilinogen findings were found in 12% (the investigators noted that the increased urobilinogen levels were probably secondary to excessive alcohol consumption or dietary excess). Enlarged livers were found in 5% of the examined workers. In the first 3 years of the study, no alterations in erythrocyte or hemoglobin levels were found. Leukopenia (defined as leukocyte levels of less than 5800) was found in 20% of the workers, but no relationship between the number of cases and duration of 1,1,2,2-tetrachloroethane exposure was found. A positive relationship between duration of exposure and frequency of abnormal liver function test results was found; statistically significant correlations were found on the thymol and Takata-Ucko liver function tests, but not the gold sol reaction test. Abnormal hippuric acid levels were only detected in 1% of the examined workers during the first 2 years and no abnormalities were observed during the third year. Increased serum bilirubin levels (greater than 1 mg/dL) were observed in 20, 18.7, and 7.6% of the workers during the first, second, and third years, respectively. The prevalence of hepatitis was assessed using sickness benefit files. In the 1-year period prior to the study, 21 cases of hepatitis were found (total number of workers not reported). Three cases of hepatitis were found in the first year of the study, 8 cases in the second year, and 4 cases in the third year. The lack of a control group and poor reporting of study design and results, precludes using this study for quantitative risk assessment.

Several animal studies have assessed the toxicity of inhaled 1,1,2,2-tetrachloroethane in animals (Shmutter, 1977; Truffert et al., 1977; Schmidt et al., 1972; Horiuchi et al., 1962). As discussed below, there are

a number of limitations to these studies. A recently conducted oral exposure study (Microbiological Associates, 1994) is also discussed. Data on the reproductive and/or developmental toxicity study is limited to a subchronic study in which exposed males were mated to unexposed females (Schmidt et al., 1972).

Shmutter (1977) exposed groups of 12 Chinchilla rabbits to 0, 2, 10, or 100 mg/m³ (0.29, 1, and 14 ppm) 1,1,2,2-tetrachloroethane for 3 hours/day, 6 days/week for 8-10 months. Animals were vaccinated with 1 mL suspensions containing heated typhoid vaccine (1.5 billion), 1.5, 4.5-5, and 7.5-8 months after the initiation of 1,1,2,2-tetrachloroethane exposure. Significant increases and decreases in total antibody levels were observed in the 2 and 100 mg/m³ groups, respectively. No significant alterations in 7S-typhoid antibody levels were observed. Significant alterations in the levels of "normal hemolysins to the Forsman antigen of RAM erythrocytes" were observed in the 10 and 100 mg/m³ groups; levels were increased in the 10 mg/m³ after 1.5, 2, and 2.5 months of exposure, decreased in the 10 mg/m³ group after 4 months of exposure and decreased in the 100 mg/m³ group during the first 6 months of exposure. Shmutter (1977) also reported increases in the electrophoretic mobility of specific antibodies. Exposure to 100 mg/m³ resulted in a decrease in the relative content of antibodies in the γ globulin fraction and an increase in the T and β fractions.

Truffert et al. (1977) exposed a group of 55 female Sprague Dawley rats to 1,1,2,2-tetrachloroethane 5 days/week for 15 weeks (78 exposures). The daily exposure duration for the first 8 exposures was 6 hours, thereafter the duration was 5 hours (TWA daily exposure was 5.1 hours/day). The authors reported the calculated atmospheric concentration as 560 mL/m³, this would correspond to a concentration of approximately 888,000 mg/m³ (130,000 ppm); it is likely that the reported concentration is not correct: (1) it is not likely that any animals would have survived 15 weeks of exposure to such a high concentration of 1,1,2,2-tetrachloroethane [LC₅₀ is approximately 1300 ppm (ATSDR, 1996)] and (2) this concentration exceeds the saturation point of 6600 ppm at 21°C. A group of 55 rats was used as controls. Interim sacrifices were conducted after 2, 4, 9, 19, 39, and 63 exposures (number of animals killed at each time period was not reported). Abnormal clinical signs were limited to pronounced prostration after the first exposure to 1,1,2,2-tetrachloroethane. Decreases in weight gain were observed, however the authors did not report the magnitude of the change or the statistical significance. Increases in relative liver weights were observed beginning 2 weeks of exposure initiation. Hematological alterations were limited to a slight decrease in hematocrit. A dramatic increase (313%) in thymidine uptake in hepatic DNA was observed after 4 exposures; by the ninth exposure, thymidine uptake had decreased but still remained higher than in controls. Histological alterations were observed in the liver after nine exposures, these included granular appearance, cytoplasmic vacuolization, and evidence of hyperplasia (increase in number of binuclear cells and appearance of mitosis); the hepatic histological alterations regressed after 19 exposures and were no longer observed after 39 exposures. No histological alterations were observed in the kidneys, lungs, adrenals, ovaries, or uterus. Due to the uncertainty in the exposure concentration, a LOAEL can not be identified from this study.

In a subchronic inhalation study conducted by Schmidt et al. (1972), groups of 105 rats were exposed to 0 or 0.0133 mg/L (13.3 mg/m³; 1.94 ppm) "daily" for 4 hours/day for 265 days. Groups of seven rats were killed after 110 or 265 days of exposure and 60 days after exposure termination, the remaining animals were observed until natural death. No significant alterations in survival were observed. Significant decreases in body weight gain were observed after 90-170 days of exposure; after 110 days of exposure, the 1,1,2,2-

tetrachloroethane-exposed rats weighed 3% less than controls, body weight data were not provided for other time periods. The following statistically significant alterations were observed after 110 days of exposure: increases in leukocyte levels, increases in β_1 globulin levels, and decreases in ACTH activity in the pituitary gland. After 265 days of exposure, there were significant increases in the percentage of segmented nucleated neutrophils, decreases in the percentage of lymphocytes, increases in total fat content of the liver, and decreases in pituitary ACTH activity (leukocyte levels did not differ from controls). γ -Globulin levels were not affected at either time period. This study is insufficient for identification of a NOAEL/LOAEL for subchronic exposure because the study design and results were poorly reported and gross and/or histological examinations of the major tissues/organs were not performed.

The Schmidt et al. (1972) study also included a reproductive/developmental toxicity substudy. One week before the end of the 9-month exposure, groups of seven control and 1,1,2,2-tetrachloroethane-exposed rats were mated with unexposed virgin female rats. It appears that each male was mated with five females. The offspring were observed for 12 weeks and were examined macroscopically for malformations. No significant differences in the percentage of females having offspring (77.1% in controls vs 62.9% in exposed), number of pups per litter, average birth weight, gestation length, sex ratio, offspring mortality at postnatal days 1, 2, 7, 14, 21, and 84), and average weight on postnatal day 84). No macroscopic malformations were found.

Horiuchi et al. (1962) exposed an adult male monkey (*Macaca cynomolga* Linné) to 1,1,2,2-tetrachloroethane 2 hours/day, 6 days/week for 9 months (190 exposures). The 1,1,2,2-tetrachloroethane exposure level was 2000-4000 ppm (291-583 mg/m³) for the first 20 exposures, 1000-2000 ppm (146-291 mg/m³) for the next 140 exposures, and 3000-4000 ppm (437-583 mg/m³) for the last 30 exposures. The authors noted that the monkey was weak after seven exposures and had diarrhea and anorexia between the twelfth and fifteenth exposures. Beginning at the fifteenth exposure, the monkey was "almost completely unconscious falling upon his side" 20 to 60 minutes after each exposure. Although the authors noted some changes in body weight gain and hematological parameters, the significance of these findings can not be determined because only one monkey was tested and there was no control group. Histological alterations consisted of fatty degeneration in the liver and splenic congestion. This study can not be used to identify a NOAEL/LOAEL for subchronic exposure because only one animal was tested.

In a subchronic study conducted for NTP (Microbiological Associates, 1994), groups of male and female F344 rats and B6C3F1 mice (10/sex/group/species) were fed diets containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks. The reported dosages were 18, 37, 75, 150, and 300 mg/kg-day for rats and 88, 175, 350, 700, and 1400 mg/kg-day for mice; vehicle and untreated control groups were used for each species. In the rats, no chemical-related alterations in mortality were observed. Significant decreases in body weight gain were observed in the male and female rats exposed to 75 (10.5 and 24.1% difference from vehicle controls for males and females) and 150 (45.4 and 63.2%) mg/kg-day, and weight loss was observed at the 300 mg/kg-day dose level. The decrease in body weight gain in the 150 mg/kg-day group and weight loss in the 300 mg/kg-day group were associated with reductions in food consumption. Thinness and pallor were observed in all animals in the 150 and 300 mg/kg-day groups. Statistically significant increases in absolute and relative liver weights were observed in males and females exposed to 37 mg/kg-day and higher. Significant alterations in absolute and/or relative weights were also observed in several other organs, these changes were considered secondary to the decreased body weight gain. A number of alterations in serum clinical chemistry parameters

consistent with liver damage were found: increased alanine aminotransferase, alkaline phosphatase, and sorbitol dehydrogenase levels in the 150 and 300 mg/kg-day groups, increased bile acid levels in the 300 mg/kg-day group, and decreased total protein, cholesterol, and/or albumin levels in the 150 and 300 mg/kg-day groups. Other alterations in serum chemistry parameters were not considered chemical-related. The liver appeared to be the primary target of 1,1,2,2-tetrachloroethane toxicity, histopathological alterations consisted of basophilic, eosinophilic, mixed cell, and/or clear cell foci of cellular alterations (incidence significantly higher in males exposed to 300 mg/kg-day and females exposed to ≥ 150 mg/kg-day), hepatocyte necrosis (males and females: ≥ 150 mg/kg-day), mitotic alterations in hepatocytes (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), liver pigmentation (males and females: ≥ 150 mg/kg-day), bile duct hyperplasia (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), hepatocyte hypertrophy (males: ≥ 150 mg/kg-day; females: ≥ 75 mg/kg-day), and cytoplasmic vacuolization (males: ≥ 18 mg/kg-day; females: ≥ 37 mg/kg-day). Other histopathological alterations consisted of spleen pigmentation (males: ≥ 75 mg/kg-day; females: ≥ 150 mg/kg-day), bone marrow atrophy (males and females: ≥ 150 mg/kg-day), spleen red pulp atrophy (males: ≥ 150 mg/kg-day; females: 300 mg/kg-day), clitoral gland and uterus atrophy (females: ≥ 150 mg/kg-day), bone metaphysis atrophy (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), and atrophy of the preputial gland, prostate, seminal vesicle, and testes (males: 300 mg/kg-day); the atrophy was considered secondary to the decrease in body weight gain. To summarize, this study provides evidence that the liver is a primary target of 1,1,2,2-tetrachloroethane toxicity. At the lowest dose tested, 18 mg/kg-day, there was a significant increase in the incidence of cytoplasmic vacuolization, this minimal effect was not considered adverse. At 37 mg/kg-day, significant increases in absolute and relative liver weights were observed, hepatocellular hypertrophy, spleen pigmentation, and decreases in body weight gain were observed at the next highest dosage (75 mg/kg-day). At 150 and 300 mg/kg-day, alterations in liver-related serum chemistry parameters (e.g., alanine aminotransferase, cholesterol), hepatocyte necrosis, bile duct hyperplasia, hepatocellular mitotic alterations, foci of cellular alterations, and liver pigmentation were observed (other effects observed at these dose levels were probably related to the marked decrease in body weight gain). Thus, this study identifies a NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day for liver effects in rats fed a diet containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks.

In mice, no chemical-related deaths were observed (Microbiological Associates, 1994). Significant decreases in body weight gain were observed in the male and female mice exposed to 350, 700, or 1400 mg/kg-day (difference from vehicle control: 43.8, 52.1, and 69.8%, respectively, for males and 13.5, 28.4, and 39.2% for females). Significant increases in absolute and relative liver weights were observed in the male mice exposed to 175 mg/kg-day or higher and in female mice exposed to 88 mg/kg-day or higher. Other changes in organ weights were considered to be secondary to the body weight changes. Chemical-related alterations in serum clinical chemistry consisted of decreases in total protein levels (males exposed to ≥ 175 mg/kg-day and females exposed to ≥ 700 mg/kg-day), decreases in cholesterol levels (males and females: ≥ 175 mg/kg-day), and increases in alanine aminotransferase, alkaline phosphatase, sorbitol dehydrogenase, and bile acids (males and females: ≥ 350 mg/kg-day). Histopathological evidence suggested that the liver was the most sensitive target of 1,1,2,2-tetrachloroethane toxicity. The hepatic alterations consisted of hepatocyte hypertrophy (males: ≥ 175 mg/kg-day; females: ≥ 88 mg/kg-day), and hepatocyte necrosis, focal pigmentation, bile duct hyperplasia, and/or hepatocyte hypertrophy (male and female: ≥ 350 mg/kg-day). An increase in lung focal lymphocyte cellular infiltration was observed in the female mice exposed to 700 or 1400 mg/kg-day, however the number of infiltrates was within the normal range and was not considered to be related to 1,1,2,2-tetrachloroethane

exposure. An increase in the number of residual bodies present in the seminiferous tubules of mice exposed to 1400 mg/kg-day and increases in the incidence of thymus atrophy in male and female mice exposed to 1400 mg/kg-day were observed; these effects were considered to be secondary to the decrease in body weight gain. Thus, this study identifies a minimal LOAEL of 88 mg/kg-day for liver effects (increased absolute and relative liver weights and hepatocyte hypertrophy at 88 mg/kg-day and multiple liver effects at higher doses) in mice exposed to dietary 1,1,2,2-tetrachloroethane for 13 weeks; a NOAEL was not identified.

DERIVATION OF PROVISIONAL RfC

The human and animal inhalation studies are inadequate for the derivation of a provisional RfC for 1,1,2,2-tetrachloroethane. However, the results of these studies suggest that the liver is a sensitive target of toxicity following inhalation exposure. Additionally, the available inhalation data suggest that the respiratory tract is not a particularly sensitive target. The oral toxicity database is sufficient to support derivation of a provisional RfD for 1,1,2,2-tetrachloroethane. A provisional RfD of 6E-2 mg/kg-day was derived from the Microbiological Associates (1994) study using an uncertainty factor of 300 (for additional information, please see the Issue Paper for the Provisional RfD).

In the absence of adequate inhalation data, a route-to-route extrapolation was considered. This approach is supported by the toxicokinetic data (as reviewed by ATSDR, 1996) which suggest that 1,1,2,2-tetrachloroethane is well-absorbed following oral or inhalation exposure and toxicity data which provide evidence that the liver may be the most sensitive target of toxicity following oral or inhalation exposure. The mechanisms of toxicity of 1,1,2,2-tetrachloroethane on the liver most likely involves oxidative and/or reductive reactions to form the proximate toxicant. Following oral exposure, 1,1,2,2-tetrachloroethane is likely to be delivered to the liver via the portal vein and metabolized prior to entering the systemic circulation ("first pass" effect). Thus, it is likely that orally administered 1,1,2,2-tetrachloroethane will be more potent than inhaled 1,1,2,2-tetrachloroethane. No pharmacokinetic/pharmacodynamic data are available for this chemical which could be used to make adjustments for the first pass effect. It is likely that deriving an RfC based on oral exposure data will result in a value that is overprotective of liver effects following inhalation exposure. However, this uncertainty coupled with other uncertainties in the 1,1,2,2-tetrachloroethane database (lack of adequate reproductive and/or developmental toxicity data) precludes deriving an RfC for 1,1,2,2-tetrachloroethane.

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**Risk Assessment Issue Paper for:
Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

INTRODUCTION

An RfD for 1,1,2,2-tetrachloroethane is not available on IRIS (U.S. EPA, 1997a) or HEAST (U.S. EPA, 1997b). Drinking water health advisories have not been derived for 1,1,2,2-tetrachloroethane. ATSDR (1996) derived an intermediate oral minimal risk level (MRL) and a chronic oral MRL for this chemical. The intermediate MRL of 0.6 mg/kg-day is based on a NOAEL of 56 mg/kg for decreases in body weight gain in female rats receiving gavage doses of 100 mg/kg 1,1,2,2-tetrachloroethane 5 days/week for 6 weeks (NCI, 1978). The basis for the chronic MRL of 0.04 mg/kg-day is a LOAEL for labored respiration, wheezing, and nasal discharge observed in female rats receiving gavage doses of 43 mg/kg 5 days/week for 78 weeks (NCI, 1978).

The most recent document on 1,1,2,2-tetrachloroethane listed in the CARA database (U.S. EPA, 1991, 1994) is a HEA (U.S. EPA, 1984). The HEA, Toxicological Profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996), and a literature search of the following databases (conducted in November 1997): TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were used to identify relevant data for the derivation of a provisional RfD for 1,1,2,2-tetrachloroethane.

REVIEW OF PERTINENT LITERATURE

There are several reports of accidental and intentional ingestion of a single dose of 1,1,2,2-tetrachloroethane (as reviewed by NIOSH, 1976). Loss of consciousness, CNS depression, and death were the most common outcomes. Data on the effects associated with repeated oral exposure are not available for humans.

NCI (1978) and NTP (1996; Microbiological Associates, 1994) have investigated the subchronic and chronic oral toxicity of 1,1,2,2-tetrachloroethane in rats and mice. Data on the reproductive and developmental toxicity of 1,1,2,2-tetrachloroethane is limited to an inhalation study in which subchronically exposed male rats were mated to unexposed female rats (Schmidt et al., 1972).

In the NCI (1978) study, groups of male and female Osborne-Mendel rats and B6C3F1 mice (50/sex/group/species) were administered 1,1,2,2-tetrachloroethane in corn oil via gavage 5 days/week for 78 weeks. The TWA average doses were 62 and 109 mg/kg for male rats, 43 and 77 mg/kg for female rats, and 142 and 283 mg/kg for male and female mice. The exposure period was followed by a 32- or 12-week period in

which the rats and mice, respectively, were not exposed to 1,1,2,2-tetrachloroethane. Vehicle control and untreated control groups (20 animals/sex/species/group) were also used. A statistically significant association between increased mortality and dose was observed in the female rats; 10 of the high-dose females died during the first 5 weeks of the study (8 had pneumonia and no lesions were reported in the other 2 rats); NCI (1978) considered the deaths to be related to 1,1,2,2-tetrachloroethane exposure. No significant effects on survival were observed in the low-dose female rats and in both male dose groups. Clinical signs observed in the rats included a hunched appearance in the high-dose females and squinted or reddened eyes in both groups of 1,1,2,2-tetrachloroethane-exposed rats. The investigators noted that there was a low or moderate incidence of labored breathing, wheezing, and/or nasal discharge in all groups of animals during the first year of the study; near the end of the study, these respiratory signs were more frequently observed in the 1,1,2,2-tetrachloroethane-exposed animals; no additional information on this effect was provided. Dose-related decreases in body weight gain were observed in the rats; the differences between body weights of the vehicle control rats and the low- and high-dose rats were less than 10% for the low-dose group and 20 and 15% for the high-dose male and female rats, respectively. No significant increases in tumor incidence were observed in the rats. The incidences of hepatic fatty metamorphosis in high-dose male rats (0/20, 2/50, 9/49 in the vehicle control, low, and high-dose groups) and chronic murine pneumonia in low- and high-dose female rats (8/20, 34/50, 38/50, respectively) were significantly increased ($p < 0.05$, Fisher Exact Test). Thus, this study identifies a LOAEL of 43 mg/kg (31 mg/kg-day) for an increased incidence of chronic murine pneumonia in female rats exposed to gavage doses of 1,1,2,2-tetrachloroethane for 78 weeks and FEL of 77 mg/kg (55 mg/kg-day).

A statistically significant association between mortality and dose was found in mice (NCI, 1978). There was a dramatic decrease in probability of survival after 45 weeks of exposure in the high-dose male and female mice. Acute toxic tubular nephrosis was determined to be the apparent cause of death in 33 high-dose males dying between weeks 69 and 70; the cause of death was not reported in the female mice. A high incidence (95%) of pronounced abdominal distension, probably resulting from liver tumors, was observed in the high-dose females beginning in week 60 and continuing throughout the recovery period. A very slight decrease in body weight gain (less than 10%) was observed in the high dose male mice; no other effects on body weight gain were observed. Significant increases in the incidence of hepatocellular carcinoma were observed in the low- and high-dose male and female mice. Significant increases in the incidence of nonneoplastic lesions were limited to hydronephrosis (0/20, 0/46, 16/46 in the control, low and high dose groups) and chronic inflammation (0/20, 0/46, and 5/46) in the kidneys of high-dose females. This study identifies a NOAEL of 142 mg/kg (101 mg/kg-day) and a FEL of 283 mg/kg (202 mg/kg-day) in mice exposed to 1,1,2,2-tetrachloroethane for 78 weeks.

NCI (1978) also conducted a subchronic range-finding study in rats and mice. In this study, groups of five male and five female Osborne Mendel rats received gavage doses of 0 (vehicle control group), 56, 100, 178, 316, and 562 mg/kg 1,1,2,2-tetrachloroethane in corn oil 5 days/week for 6 weeks followed by a 2 week observation period. Groups of five male and five female B6C3F1 mice were similarly exposed to 0, 32, 56, 100, 178, and 316 mg/kg 1,1,2,2-tetrachloroethane. It appears that mortality and body weight gain were the only endpoints used to assess toxicity. In the rats, increased mortality was observed in one male exposed to 100 mg/kg, and all five females exposed to 316 mg/kg (mortality rates in the 516 mg/kg group were not discussed). Decreases in body weight gain were observed in the rats at the 56, 100, and 178 mg/kg doses; the differences were 3, 9, and 38% for the males and 9, 24, and 41% for the females. No deaths were observed in the mice and

there were no significant alterations in body weight gain. The limited number of endpoints examined in this study precludes identifying NOAELs and/or LOAELs for subchronic exposure.

In a subchronic study conducted for NTP (Microbiological Associates, 1994), groups of male and female F344 rats and B6C3F1 mice (10/sex/group/species) were fed diets containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks. The reported dosages were 18, 37, 75, 150, and 300 mg/kg-day for rats and 88, 175, 350, 700, and 1400 mg/kg-day for mice; vehicle and untreated control groups were used for each species. In the rats, no chemical-related alterations in mortality were observed. Significant decreases in body weight gain were observed in the male and female rats exposed to 75 (10.5 and 24.1% difference from vehicle controls for males and females) and 150 (45.4 and 63.2%) mg/kg-day, and weight loss was observed at the 300 mg/kg-day dose level. The decrease in body weight gain in the 150 mg/kg-day group and weight loss in the 300 mg/kg-day group were associated with reductions in food consumption. Thinness and pallor were observed in all animals in the 150 and 300 mg/kg-day groups. Statistically significant increases in absolute and relative liver weights were observed in males and females exposed to 37 mg/kg-day and higher. Significant alterations in absolute and/or relative weights were also observed in several other organs, these changes were considered secondary to the decreased body weight gain. A number of alterations in serum clinical chemistry parameters consistent with liver damage were found: increased alanine aminotransferase, alkaline phosphatase, and sorbitol dehydrogenase levels in the 150 and 300 mg/kg-day groups, increased bile acid levels in the 300 mg/kg-day group, and decreased total protein, cholesterol, and/or albumin levels in the 150 and 300 mg/kg-day groups. Other alterations in serum chemistry parameters were not considered chemical-related. The liver appeared to be the primary target of 1,1,2,2-tetrachloroethane toxicity, histopathological alterations consisted of basophilic, eosinophilic, mixed cell, and/or clear cell foci of cellular alterations (incidence significantly higher in males exposed to 300 mg/kg-day and females exposed to ≥ 150 mg/kg-day), hepatocyte necrosis (males and females: ≥ 150 mg/kg-day), mitotic alterations in hepatocytes (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), liver pigmentation (males and females: ≥ 150 mg/kg-day), bile duct hyperplasia (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), hepatocyte hypertrophy (males: ≥ 150 mg/kg-day; females: ≥ 75 mg/kg-day), and cytoplasmic vacuolization (males: ≥ 18 mg/kg-day; females: ≥ 37 mg/kg-day). Other histopathological alterations consisted of spleen pigmentation (males: ≥ 75 mg/kg-day; females: ≥ 150 mg/kg-day), bone marrow atrophy (males and females: ≥ 150 mg/kg-day), spleen red pulp atrophy (males: ≥ 150 mg/kg-day; females: 300 mg/kg-day), clitoral gland and uterus atrophy (females: ≥ 150 mg/kg-day), bone metaphysis atrophy (males: 300 mg/kg-day; females: ≥ 150 mg/kg-day), and atrophy of the preputial gland, prostate, seminal vesicle, and testes (males: 300 mg/kg-day); the atrophy was considered secondary to the decrease in body weight gain. To summarize, this study provides evidence that the liver is a primary target of 1,1,2,2-tetrachloroethane toxicity. At the lowest dose tested, 18 mg/kg-day, there was a significant increase in the incidence of cytoplasmic vacuolization, this minimal effect was not considered adverse. At 37 mg/kg-day, significant increases in absolute and relative liver weights were observed; hepatocellular hypertrophy, spleen pigmentation, and decreases in body weight gain were observed at the next highest dosage (75 mg/kg-day). At 150 and 300 mg/kg-day, alterations in liver-related serum chemistry parameters (e.g., alanine aminotransferase, cholesterol), hepatocyte necrosis, bile duct hyperplasia, hepatocellular mitotic alterations, foci of cellular alterations, and liver pigmentation were observed (other effects observed at these dose levels were probably related to the marked decrease in body weight gain). Thus, this study identifies a NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day for liver effects in rats fed a diet containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks.

In mice, no chemical-related deaths were observed (Microbiological Associates, 1994). Significant decreases in body weight gain were observed in the male and female mice exposed to 350, 700, or 1400 mg/kg-day (difference from vehicle control: 43.8, 52.1, and 69.8%, respectively, for males and 13.5, 28.4, and 39.2% for females). Significant increases in absolute and relative liver weights were observed in the male mice exposed to 175 mg/kg-day or higher and in female mice exposed to 88 mg/kg-day or higher. Other changes in organ weights were considered to be secondary to the body weight changes. Chemical-related alterations in serum clinical chemistry consisted of decreases in total protein levels (males exposed to ≥ 175 mg/kg-day and females exposed to ≥ 700 mg/kg-day), decreases in cholesterol levels (males and females: ≥ 175 mg/kg-day), and increases in alanine aminotransferase, alkaline phosphatase, sorbitol dehydrogenase, and bile acids (males and females: ≥ 350 mg/kg-day). Histopathological evidence suggested that the liver was the most sensitive target of 1,1,2,2-tetrachloroethane toxicity. The hepatic alterations consisted of hepatocyte hypertrophy (males: ≥ 175 mg/kg-day; females: ≥ 88 mg/kg-day), and hepatocyte necrosis, focal pigmentation, bile duct hyperplasia, and/or hepatocyte hypertrophy (male and female: ≥ 350 mg/kg-day). An increase in lung focal lymphocyte cellular infiltration was observed in the female mice exposed to 700 or 1400 mg/kg-day, however the number of infiltrates was within the normal range and was not considered to be related to 1,1,2,2-tetrachloroethane exposure. An increase in the number of residual bodies present in the seminiferous tubules of mice exposed to 1400 mg/kg-day and increases in the incidence of thymus atrophy in male and female mice exposed to 1400 mg/kg-day were observed; these effects were considered to be secondary to the decrease in body weight gain. Thus, this study identifies a minimal LOAEL of 88 mg/kg-day for liver effects (increased absolute and relative liver weights and hepatocyte hypertrophy at 88 mg/kg-day and multiple liver effects at higher doses) in mice exposed to dietary 1,1,2,2-tetrachloroethane for 13 weeks, a NOAEL was not identified.

In a study examining the potential renal toxicity of orally administered halogenated ethanes, groups of five male F344/N rats received via gavage 0, 0.62, or 1.24 mmol/kg-day 1,1,2,2-tetrachloroethane in corn oil (0, 104, 208 mg/kg-day) daily for 21 days (NTP, 1996). All animals were grossly examined, the right kidney, liver, and right testis were weighed and the right kidney, left liver lobe, and gross lesions were examined histopathologically. Rats in the high-dose group died or were killed moribund before the end of the study; clinical observations included thin and lethargic (5/5 animals) and diarrhea accompanied by abnormal breathing and ruffled fur (3/5). In the low-dose group, no effects on survival, body weight gain, absolute and relative liver and kidney weights, or kidney histopathology were observed. Mild to moderate cytoplasmic vacuolization, consisting of multifocal areas of hepatocytes with clear droplets within the cytoplasm, was observed in the hepatocytes of all rats in the low dose group. The cytoplasmic vacuolization observed at 104 mg/kg-day was considered a minimal effect. Thus, the 104 mg/kg-day dose is a NOAEL in rats exposed to 1,1,2,2-tetrachloroethane for 21 days and 208 mg/kg-day is a FEL.

In a 9-month inhalation study conducted by Schmidt et al. (1972), groups of 105 male rats were exposed to 0 or 0.0133 mg/L (1.94 ppm) 1,1,2,2-tetrachloroethane "daily" for 4 hours/day. One week before the end of the study, groups of seven control and 1,1,2,2-tetrachloroethane-exposed rats were mated with unexposed virgin female rats. It appears that each male was mated with five females. The offspring were observed for 12 weeks and were examined macroscopically for malformations. There were no statistically significant differences in the percentage of females having offspring (77.1% in controls vs 62.9% in exposed), number of pups per litter,

average birth weight, gestation length, sex ratio, offspring mortality at postnatal days 1, 2, 7, 14, 21, and 84, or average weight on postnatal day 84. No macroscopic malformations were found.

DERIVATION OF PROVISIONAL RfD

The subchronic toxicity studies conducted by Microbiological Associates (1994) for NTP suggest that the liver may be the most sensitive endpoint. Liver effects were observed at the lowest doses tested in rats and mice (18 and 88 mg/kg-day, respectively). The liver effects consisted of hepatocellular vacuolization and increases in absolute and relative liver weights at the low doses and hepatocyte necrosis and bile duct hyperplasia at higher doses. In the rat study, the increased incidence of cytoplasmic vacuolization observed at 18 mg/kg-day was not considered adverse. The increases in absolute and relative liver weight observed in rats exposed to 37 mg/kg-day were considered adverse and this dose was identified as the LOAEL. Liver effects were also reported in the 21-day rat study by NTP (1996) and the NCI (1978) chronic rat study. NTP (1996) found an increase in the incidence of cytoplasmic vacuolization in rats receiving gavage doses of 104 mg/kg-day (lowest dose tested) for 21 days and NCI (1978) observed a slight increase in the incidence of hepatic fatty metamorphosis in rats gavaged with 55 mg/kg-day (no liver effects were observed at 31 mg/kg-day) for 78 weeks. No nonneoplastic liver effects were observed in mice receiving gavage doses of 101 or 202 mg/kg-day for 78 weeks (an increase in the incidence of hepatocellular carcinomas were observed at both doses) (NCI, 1978). An increase in the incidence of chronic murine pneumonia was observed in rats receiving gavage doses of 31 mg/kg-day for 78 weeks (NCI, 1978).

Derivation of a provisional RfD for 1,1,2,2-tetrachloroethane based on the NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day identified in the rat subchronic study (Microbiological Associates, 1994) is recommended. The chronic rat study was not selected as the basis for the RfD because the chronic murine pneumonia observed at the lowest dose tested has not been observed in other oral or inhalation studies, is common age-related effect (incidence in the untreated control group was 90%), and the incidence was not dose-related. The NOAEL of 18 mg/kg-day was divided by an uncertainty factor of 300 (10 for interspecies extrapolation, 10 for intrahuman variability, and 3 for database deficiencies) to yield a provisional RfD of **6E-2 mg/kg-day**. An uncertainty factor to account for the extrapolation from a subchronic study was not used because the results of the chronic rat study (NCI, 1978) do not suggest that more serious liver effects would occur at lower doses following chronic exposure. Thus, a partial uncertainty factor was used to extrapolate from a subchronic study to a chronic study. The uncertainty factor for database deficiencies was used to account for the lack of a 2-generation reproductive performance study and adequate developmental toxicity studies in two species.

Confidence in the Microbiological Associates (1994) study is high, it is a well-conducted study using an adequate number of animals and monitoring appropriate toxicity endpoints. Confidence in the database is low-to-medium because a NOAEL was not identified for hepatic effects and adequate reproductive and developmental toxicity studies are not available. Reflecting the low-to-medium confidence in the database, confidence in this provisional RfD is low.

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7041518

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TAB

Appendix J

APPENDIX J

Ecological Assessment Checklist

Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Northeast Open Area
Location: Dunn Field
County: Shelby City: Memphis State: TN
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? 16 acres
4. Is this the first site visit? ☒ Yes ☐ No *If no, attach trip report of previous site visit(s), if available.*
Date(s) of previous site visit(s): _____
5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map.
6. Are aerial or other site photographs available? ☒ Yes ☐ No *If yes, please attach any available photo(s) to the site map at the conclusion of this section. see attached*
7. The land use on the site is: _____
The area surrounding the site is: 0.5 mile radius

____ % Urban

____ % Urban

____ % Rural

____ % Rural

____ % Residential

30% Residential

100 % Industrial (☒light ☐heavy)70% Industrial (☒light ☐heavy)

____ % Agriculture

____ % Agriculture

(Crops _____)

(Crops_____)

____ % Recreational

____ % Recreational

(Describe; note if it is a park, etc.)

(Describe; note if it is a park, etc.)

____ % Undisturbed

____ % Undisturbed

____ % Other

____ % Other

- 8 Has any movement of soil taken place at the site? ☐Yes ☒No If yes, please identify the most likely cause of this disturbance:

☐Agricultural Use☐Heavy Equipment☐Mining☐Natural Events☐Erosion☐Other

Please describe.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996), US Fish and Wildlife Service National Wetland Inventory Maps.

- 10 What type of facility is located at the site?

☐Chemical☐Manufacturing☐Mixing☐Waste Disposal☒Other (specify) several former pistol ranges.

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? Various inorganic and organic chemicals detected in surface soils, surface water, and sediment See Section 8 of RFI report for specifics.

12. Check any potential routes of off-site migration of contaminants observed at the site

- ☐ Swales ☐ Depressions ☒ Drainage Ditches
☐ Runoff ☐ Windblown Particulates ☐ Vehicular Traffic
☐ Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14. Is the direction of surface runoff apparent from site observations? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

- ☒ Surface Water ☐ Groundwater ☐ Sewer ☐ Collection Impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.

- ☐ Yes (approximate distance _____) ☒ No

17. Is there evidence of flooding? ☐ Yes ☒ No Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use a blank sheet if additional space is needed for text.] A Field Guide to the Birds - Peterson, R.T., 1980. Approximately 1 hour was spent at this site observing site conditions.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ Yes ☒ No If yes, you are required to verify this information with the U.S. Fish and Wildlife Service. If species' identities are known, please list them next.

20 Record weather conditions at the time this checklist was prepared.

DATE: 6/19/97

80°F Temperature (°C/°F)

_____ Normal daily high temperature

calm Wind (direction/speed)

0 Precipitation (rain, snow)

30% Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Northeast Open Area is a relatively inactive portion of Dunn Field that is completely grassed with patches of mature hardwood trees. The area is generally open with a sloping terrain that is routinely maintained by mowing. There are no open water bodies onsite; an onsite system of concrete lined stormwater drainageways is typically dry except during rainfall events. The site is surrounded by residential areas to the north and east (beyond the perimeter fence), and by Dunn Field property to the west and south. Overall, the maintained terrestrial areas provide minimal ecological habitat for plants or animals. This site is expected to serve as a future public open space for recreational purposes, therefore no future improvement in wildlife habitat quality is expected.

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field include eastern gray squirrel, red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur in the grassed areas at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g. whitetail deer). A few wild dogs have been consistently observed roaming the Northeast Open Area. Overall the terrestrial habitat within the Northeast Open Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site.

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R Martin Affiliation CH2M HILL
Additional Preparers: NA
Site Manager: _____
Date: 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST**IIA. WOODED**

1. Are there any wooded areas at the site? ☒ Yes ☐ No *If no, go to Section IIB: Shrub/Scrub.*
2. What percentage of area of the site is wooded? (5 % _____ acres). *Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site* Qualitative field estimate
3. What is the dominant type of vegetation in the wooded area?
(Check one: ☐ Evergreen ☒ Deciduous ☐ Mixed) *Provide a photograph, if available.*
Dominant plant, if known: Oaks
4. What is the predominant size of the trees at the site? *Use diameter at breast height.*
☐ 0-6 inches ☐ 6-12 inches ☒ > 12 inches
5. Specify type of understory present, if known. *Provide a photograph, if available.* Mowed bermuda and other grasses

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No *If no, go to Section IIC: Open Field.*
2. What percentage of the site is covered by scrub/shrub vegetation? (_____ % _____ acres). *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*
3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 feet ☐ 2-5 feet ☐ >5 feet

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ Dense

☐ Patchy

☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐ Yes ☒ No *If yes, please indicate the type below:*

☐ Prairie/Plains

☐ Savannah

☐ Old Field

☐ Other (specify)

2. What percentage of the site is open field? (____%____ acres). *Indicate the open fields on the site map.*

3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒ Yes ☐ No *If yes, identify and describe them below.*

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site primarily open grass. Low quality ecological habitat. Primarily Bermuda grass, frequently mowed.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals.

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

7041529

Northeast Open Area - 6/19/97



Southeast corner showing mowed grass, concrete lined drainage ditch, eastern perimeter fence, offsite residential area.



Northeast corner showing extensive mowed grass, few mature trees, concrete lined drainage ditch, and part of shed at Site 60 Pistol Range.

Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Stockpile Area
Location: Dunn Field
County: Shelby City: Memphis State: TN
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? 30 acres
4. Is this the first site visit? ☒ Yes ☐ No *If no, attach trip report of previous site visit(s), if available.*
Date(s) of previous site visit(s): _____
5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map.
6. Are aerial or other site photographs available? ☒ Yes ☐ No *If yes, please attach any available photo(s) to the site map at the conclusion of this section. see attached 2 photos*
7. The land use on the site is: _____ The area surrounding the site is:
0.5 mile radius

____ % Urban

____ % Urban

____ % Rural

____ % Rural

____ % Residential

40% Residential

100 % Industrial (☒light ☐heavy)60% Industrial (☒light ☐heavy)

____ % Agriculture

____ % Agriculture

(Crops: ____)

(Crops ____)

____ % Recreational

____ % Recreational

(Describe; note if it is a park, etc.)

(Describe; note if it is a park, etc.)

____ % Undisturbed

____ % Undisturbed

____ % Other

____ % Other

8. Has any movement of soil taken place at the site? ☒Yes ☐No If yes, please identify the most likely cause of this disturbance:

☐Agricultural Use☒Heavy Equipment☐Mining☐Natural Events☐Erosion☐Other

Please describe. This area was used for long term storage of massive piles of fluorspar and bauxite. Recently all surface material was removed, and a clean cover of soil was put in place.

- 9 Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information. No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996); US Fish and Wildlife Service National Wetland Inventory Maps.

10. What type of facility is located at the site?

☐Chemical☐Manufacturing☐Mixing☐Waste Disposal

☒Other (specify) Surface storage of mineral ores, including fluorspar and bauxite

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? A few inorganic and organic chemicals detected in the surface soil fill material. See Section 11 of RFI report for specifics.

12. Check any potential routes of off-site migration of contaminants observed at the site:

- ☐ Swales
 ☐ Depressions
 ☐ Drainage Ditches
☐ Runoff
 ☒ Windblown Particulates
 ☒ Vehicular Traffic
☐ Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14. Is the direction of surface runoff apparent from site observations? ☐ Yes ☒ No *If yes, to which of the following does the surface runoff discharge? Indicate all that apply.*

- ☐ Surface Water
 ☐ Groundwater
 ☐ Sewer
 ☐ Collection Impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? *If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.*

- ☐ Yes (approximate distance _____)
 ☒ No

17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V: Wetland Habitat Checklist.*

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. *[Use a blank sheet if additional space is needed for text.]* A Field Guide to the Birds - Peterson, R.T., 1980. Approximately 1 hour was spent at this site observing site conditions

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ Yes ☒ No *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service. If species' identities are known, please list them next.*

20. Record weather conditions at the time this checklist was prepared.

DATE: 6/19/97

80oF Temperature (°C/°F)

_____ Normal daily high temperature

calm Wind (direction/speed)

0 Precipitation (rain, snow)

_____ Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Stockpile Area is a currently inactive portion of Dunn Field that is completely grassed and has no trees. The area is entirely open with a relatively level terrain that is routinely maintained by mowing. Former large piles of fluorspar and bauxite were recently removed and clean soil was added as a cover in portions of the site. There are no water bodies onsite. The site is surrounded by a residential area to the east (beyond the perimeter fence), by Dunn Field property to the north (Northeast Open Area) and west (Disposal Area), and by DDMT Main Installation to the south beyond the perimeter fence and Dunn Avenue. Overall, the maintained terrestrial areas provide insignificant ecological habitat for plants or animals. This site is expected to be developed into a light industrial area, therefore no future improvement in wildlife habitat quality is expected.

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field that may occur in the grassed Stockpile Area include red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g. whitetail deer). Overall the terrestrial habitat within the Stockpile Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands onsite, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site (TDEC, 1996, USFWS, 1996; Appendix ?).

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R. Martin Affiliation CH2M HILL
Additional Preparers: NA
Site Manager: _____
Date: 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No *If no, go to Section IIB: Shrub/Scrub.*
2. What percentage of area of the site is wooded? (____%____ acres). *Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.* 0
3. What is the dominant type of vegetation in the wooded area?
(Check one: ☐ Evergreen ☐ Deciduous ☐ Mixed) *Provide a photograph, if available.*
Dominant plant, if known: 0
4. What is the predominant size of the trees at the site? *Use diameter at breast height.*
☐ 0-6 inches ☐ 6-12 inches ☐ > 12 inches
5. Specify type of understory present, if known. *Provide a photograph, if available.*

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No *If no, go to Section IIC: Open Field.*
2. What percentage of the site is covered by scrub/shrub vegetation? (____%____ acres). *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*
3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 feet ☐ 2-5 feet ☐ >5 feet
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ Dense ☐ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐ Yes ☒ No *If yes, please indicate the type below.*
☐ Prairie/Plains ☐ Savannah ☐ Old Field ☐ Other (specify)
2. What percentage of the site is open field? (____%____ acres). *Indicate the open fields on the site map*
3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒ Yes ☐ No *If yes, identify and describe them below.*
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site open grass. Low quality ecological habitat Primarily Bermuda grass, frequently mowed.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

Stockpile Area - 6/19/97



Central portion showing stockpiles, truck hauling activity, railroad tracks, mowed grass
The treeline is offsite beyond the perimeter fence



View of the southwest corner of the area showing mowed grass, perimeter fence, Dunn Avenue and Main Installation in background, and offsite active warehouse to the west

Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Disposal Area
Location: Dunn Field
County: Shelby City Memphis State: TN
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? 10 acres
4. Is this the first site visit? ☒ Yes ☐ No *If no, attach trip report of previous site visit(s), if available.*
Date(s) of previous site visit(s): _____
5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map
6. Are aerial or other site photographs available? ☒ Yes ☐ No *If yes, please attach any available photo(s) to the site map at the conclusion of this section. see attached 2 photos*
7. The land use on the site is: _____ The area surrounding the site is:
0.5 mile radius

____ % Urban

____ % Urban

____ % Rural

____ % Rural

____ % Residential

10% Residential

100 % Industrial (☒light ☐heavy)90% Industrial (☒light ☐heavy)

____ % Agriculture

____ % Agriculture

(Crops.____)

(Crops.____)

____ % Recreational

____ % Recreational

(Describe; note if it is a park, etc.)

(Describe; note if it is a park, etc.)

____ % Undisturbed

____ % Undisturbed

____ % Other

____ % Other

8. Has any movement of soil taken place at the site? ☐Yes ☒No If yes, please identify the most likely cause of this disturbance:

☐Agricultural Use☐Heavy Equipment☐Mining☐Natural Events☐Erosion☐Other

Please describe:

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information. No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996); US Fish and Wildlife Service National Wetland Inventory Maps.

10. What type of facility is located at the site?

☐Chemical☐Manufacturing☐Mixing☐Waste Disposal☒Other (specify) Subsurface disposal of hazardous waste materials

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? Various inorganic and organic chemicals detected in surface soils. See Section 11 of RFI report for specifics.

12. Check any potential routes of off-site migration of contaminants observed at the site.

- ☒ Swales ☐ Depressions ☐ Drainage Ditches
☐ Runoff ☐ Windblown Particulates ☐ Vehicular Traffic
☐ Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14. Is the direction of surface runoff apparent from site observations? ☒ Yes ☐ No *If yes, to which of the following does the surface runoff discharge? Indicate all that apply.*

- ☒ Surface Water ☐ Groundwater ☐ Sewer ☐ Collection Impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? *If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.*

- ☐ Yes (approximate distance _____) ☒ No

17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V: Wetland Habitat Checklist.*

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. *[Use a blank sheet if additional space is needed for text]* A Field Guide to the Birds - Peterson, R T., 1980. Approximately 1 hour was spent at this site observing site conditions.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ Yes ☒ No *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service. If species' identities are known, please list them next.*

20. Record weather conditions at the time this checklist was prepared:

DATE: 6/19/97

80°F Temperature (°C/°F)

_____ Normal daily high temperature

calm Wind (direction/speed)

0 Precipitation (rain, snow)

30% Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Disposal Area is a currently inactive portion of Dunn Field that is completely grassed and has no trees. The area is entirely open with a relatively level terrain that is routinely maintained by mowing. There are no water bodies onsite. A large drainage swale occurs near the southwest corner of the Disposal Area that discharges to the western fenceline through Outfall 010, however this swale does not retain water following storm events. The site is surrounded by a sparse residential area to the north (beyond the perimeter fence), by Dunn Field property to the east (Northeast Open Area) and south (Stockpile Area), and by an active warehouse and MLGW substation opposite the west fenceline. Overall, the maintained terrestrial areas provide insignificant ecological habitat for plants or animals. This site is expected to be developed into a light industrial area, therefore no future improvement in wildlife habitat quality is expected.

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field that may occur in the grassed Disposal Area include red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g. whitetail deer). Overall the terrestrial habitat within the Disposal Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands onsite, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site.

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R. Martin Affiliation CH2M HILL
Additional Preparers: NA
Site Manager: _____
Date: 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No *If no, go to Section IIB: Shrub/Scrub.*
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0
3. What is the dominant type of vegetation in the wooded area?
(Check one: ☐ Evergreen ☐ Deciduous ☐ Mixed) *Provide a photograph, if available.*
Dominant plant, if known: 0
4. What is the predominant size of the trees at the site? *Use diameter at breast height.*
☐ 0-6 inches ☐ 6-12 inches ☐ > 12 inches
5. Specify type of understory present, if known. *Provide a photograph, if available.*

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No *If no, go to Section IIC: Open Field.*
2. What percentage of the site is covered by scrub/shrub vegetation? (____%____ acres) *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*
3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 feet ☐ 2-5 feet ☐ > 5 feet
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ Dense ☐ Patchy ☐ Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐ Yes ☒ No *If yes, please indicate the type below:*
☐ Prairie/Plains ☐ Savannah ☐ Old Field ☐ Other (specify)
2. What percentage of the site is open field? (____ % ____ acres). *Indicate the open fields on the site map.*
3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

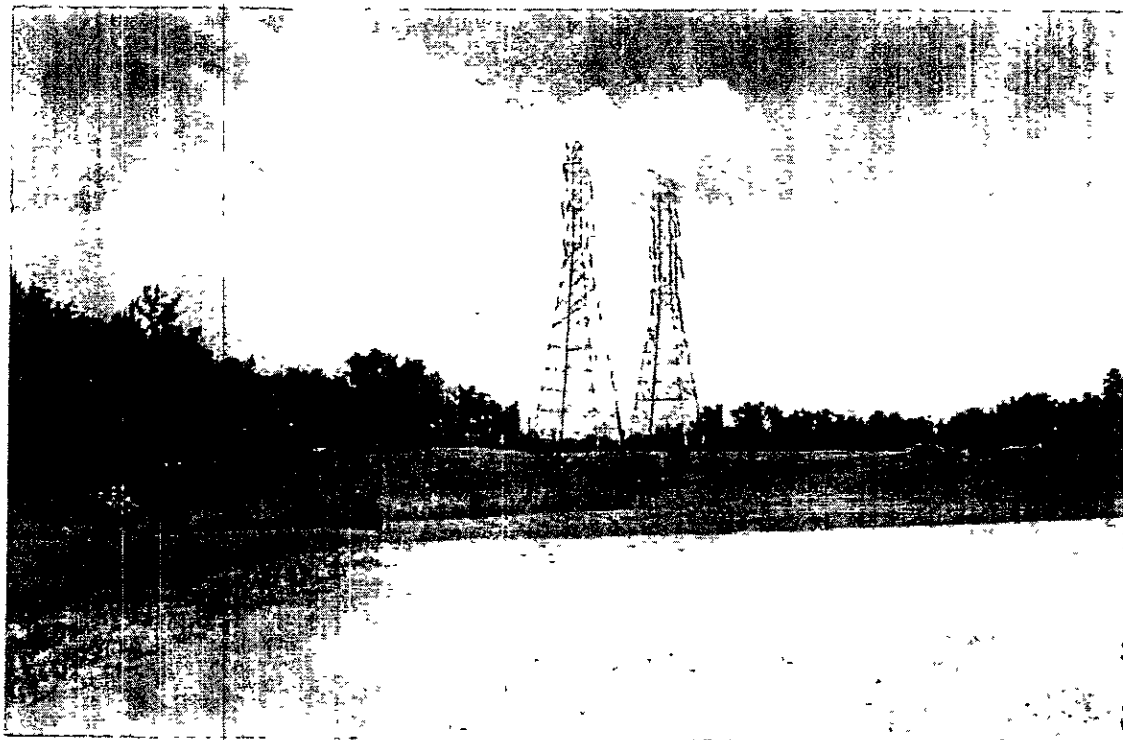
1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒ Yes ☐ No *If yes, identify and describe them below.*
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site open grass. Low quality ecological habitat Primarily Bermuda grass, frequently mowed.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals.
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

7041547

Disposal Area - 6/19/97



Northern portion showing extensive mowed grass, western perimeter fence and onsite monitoring wells, and offsite MI.G&W substation.



View from the southern end, facing north, showing concrete pad in foreground, extensive mowed grass, and drainage swale leading to western perimeter fence.

TAB

Appendix K

APPENDIX K

**Chemical Warfare Materiel Removal
Conformation Soil Sample Analytical Data
Summary**

StationID	SiteID	Sample Type :	SampleID	Date Collected :	Time Collected :	Sample Matrix :	Sample Type :
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[illegible]

StationID :
 SiteID :
 Sample Type :
 SampleID :
 Date Collected :
 Time Collected :

Parameters	Units	CWM-1 Site 01 Floor Sample DFCWM001F001 06/21/2000 12:55 PM	CWM-1 Site 01 Floor Sample DFCWM001F001 06/21/2000 1:05 PM	CWM-1 Site 01 Floor Sample DFCWM001F002 06/21/2000 4:50 PM	CWM-24 Site 24A Floor Sample DFCWM24ASF001 11/14/2000 3:00 PM	CWM-24 Site 24A Sidewall Sample DFCWM24ASW001 11/14/2000 3:15 PM	CWM-24 Site 24B Floor Sample DFCWM24BFS01 03/09/2001 10:15 AM	CWM-24 Site 24B Floor Sample DFCWM24BFS02 03/09/2001 10:30 AM	CWM-24 Site 24B Sidewall Sample DFCWM24BS01 03/09/2001 10:00 AM
Sample Matrix		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type :		N	N	N	N	N	N	N	N
Parameters	Units	420 U	420 U	420 U	420 U	41 U	93 J	41 UR	120 J
p,p'-DDD	UG/KG	420 U	420 U	420 U	420 U	41 U	15 J	41 UR	42 UR
p,p'-DDE	UG/KG	0.64 J	12 =	0.95 J	0.95 J	41 U	41 J	41 UR	42 UR
p,p'-DDT	UG/KG	420 U	420 U	420 U	420 U	41 U	41 J	41 UR	42 UR
TOXAPHENE	UG/KG	220 U	220 U	220 U	220 U	210 U	210 U	210 UR	220 UR
2,4,5,6-TETRACHLORO-META-XYLENE	%	82 =	89 =	71 =	88 =	88 =	96 =	0 =	0 =
2,4,6-TRICHLOROBIPHENYL	%	75 =	79 =	68 =	76 =	74 =	0 =	0 =	99 =
TCL SVOCs									
1,2,4-TRICHLOROBENZENE	UG/KG	420 U	420 U	420 U	420 U	810 U	230 J	98 J	840 U
1,2-DICHLOROBENZENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	910 =	280 J
1,3-DICHLOROBENZENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
1,4-DICHLOROBENZENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	670 J
2,2-OXYBIS(1-CHLORO)PROPANE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2,4,5-TRICHLOROPHENOL	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
2,4,6-TRICHLOROPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2,4-DICHLOROPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2,4-DIMETHYLPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2,4-DINITROPHENOL	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
2,4-DINITROTOLUENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2,6-DINITROTOLUENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2-CHLORONAPHTHALENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2-CHLOROPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2-METHYLNAPHTHALENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2-METHYLPHENOL (o-CRESOL)	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
2-NITROANILINE	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
2-NITROPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
3,3'-DICHLOROBENZIDINE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
3-NITROANILINE	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
4-CHLORO-3-METHYLPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
4-CHLOROANILINE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
4-METHYLPHENOL (p-CRESOL)	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
4-NITROANILINE	UG/KG	1000 U	1000 U	1000 U	1000 U	2000 U	2000 U	2100 U	2100 U
4-NITROPHENOL	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
ACENAPHTHENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
ACENAPHTHYLENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
ANTHRACENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
BENZOFURANTHRAZENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
BENZOFURANTHRENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
BENZOFURANTHRENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
BENZOFURANTHRENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
BENZYL BUTYL PHTHALATE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
bis(2-CHLOROETHOXY) METHANE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
bis(2-ETHYLHEXYL) PHTHALATE	UG/KG	110 U	110 U	110 U	110 U	810 U	810 U	820 U	840 U
CARBAZOLE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
CHRYSENE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
Di-n-BUTYL PHTHALATE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U
Di-n-OCTYL PHTHALATE	UG/KG	420 U	420 U	420 U	420 U	810 U	810 U	820 U	840 U

StationID	SiteID	Sample Type	SampleID	Date Collected	Time Collected	Sample Matrix	Sample Type
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Sample Matrix :		Sample Type :		Duplicate of FS001		Soil		12:30 PM		Soil		1:00 PM		Soil		4:30 PM		Soil		3:15 PM		Soil		10:30 AM		Soil		10:00 AM	
Parameters		Units		Soil		N		N		N		N		N		N		N		N		N		N		N		N	
DIBENZ(a,h)ANTHRACENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
DIBENZOFURAN		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
DIETHYL PHTHALATE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
DIMETHYL PHTHALATE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
FLUORANTHENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
FLUORENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
HEXACHLOROBENZENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
HEXACHLOROBUTADIENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
HEXACHLOROCYCLOPENTADIENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
HEXACHLOROCYCLOHEPTADIENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
HEXACHLOROCYCLOOCTADIENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
INDENO(1,2,3-c,d)PYRENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
ISOPHORONE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
N-NITROSODI-n-PROPYLAMINE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
N-NITROSODIPHENYLAMINE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
NAPHTHALENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
NITROBENZENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
PENTACHLOROPHENOL		UG/KG	210 U	210 U	210 U	200 U	420 U	410 U	400 U	420 U	410 U	410 U	420 U	410 U	420 U	410 U	420 U	410 U	420 U	410 U	410 U	420 U	410 U	420 U	410 U	420 U	410 U	420 U	410 U
PHENANTHRENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
PHENOL		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
PYRENE		UG/KG	420 U	420 U	420 U	390 U	840 U	810 U	800 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	840 U	810 U	820 U	810 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U	820 U	810 U
§ 2,4,6-TRIBROMOPHENOL		%	83 =	83 =	84 =	84 =	85 =	87 =	84 =	85 =	87 =	87 =	87 =	87 =	87 =	85 =	85 =	87 =	84 =	85 =	87 =	87 =	87 =	87 =	87 =	87 =	87 =	87 =	87 =
§ 2-FLUOROBIPHENYL		%	95 =	95 =	92 =	92 =	89 =	97 =	92 =	94 =	98 =	97 =	98 =	98 =	98 =	92 =	94 =	98 =	92 =	94 =	98 =	97 =	98 =	98 =	98 =	98 =	98 =	98 =	98 =
§ 2-FLUOROPHENOL		%	92 =	92 =	82 =	82 =	82 =	77 =	82 =	82 =	88 =	77 =	88 =	88 =	88 =	82 =	82 =	88 =	82 =	82 =	88 =	88 =	88 =	88 =	88 =	88 =	88 =	88 =	88 =
§ NITROBENZENE-05		%	83 =	83 =	79 =	79 =	77 =	82 =	79 =	77 =	85 =	82 =	85 =	85 =	85 =	77 =	77 =	85 =	77 =	77 =	85 =	85 =	85 =	85 =	85 =	85 =	85 =	85 =	85 =
§ PHENOL-05		%	85 =	85 =	71 =	71 =	75 =	89 =	71 =	75 =	89 =	89 =	89 =	89 =	89 =	75 =	75 =	89 =	75 =	75 =	89 =	89 =	89 =	89 =	89 =	89 =	89 =	89 =	89 =
§ TERPENTYL-014		%	94 =	94 =	86 =	86 =	94 =	93 =	86 =	94 =	96 =	93 =	96 =	96 =	96 =	94 =	94 =	96 =	94 =	94 =	96 =	96 =	96 =	96 =	96 =	96 =	96 =	96 =	96 =
TCL VOCs																													
1,1,1-TRICHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1,2,2-TETRACHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1,2-TRICHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1-DICHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-DICHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-DICHLOROPROPANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
2-HEXANONE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
ACETONE		UG/KG	23 J	23 J	21 J	30 J	32 U	27 J	28 =	32 U	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J	27 J
BENZENE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
BROMODICHLOROMETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
BROMOFORM		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
BROMOMETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CARBON DISULFIDE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CARBON TETRACHLORIDE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CHLOROBENZENE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CHLOROETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CHLOROFORM		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
CHLOROMETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
cis-1,3-DICHLOROETHYLENE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
cis-1,3-DICHLOROPROPENE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
DIBROMOCHLOROMETHANE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
ETHYLBENZENE		UG/KG	13 U	13 U	13 U	12 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
M,P-XYLE																													

[illegible]

MG/KG - milligrams per kilogram

UG/KG - micrograms per kilogram

"U" - not detected

U = not affected

resources detected - 2.

J* - estimated value

'R' - rejected var

7041554

StationID : CWM-1 FIELDQC
 SampleID : DFCWM001EB1 TRIP BLANK
 Date Collected : 06/21/2000 10/30/2000
 Time Collected : 12:00 PM 5 20 PM
 Sample Matrix : SQ WQ
 Sample Type : EB TB

Parameter	Units		
Metals			
ALUMINUM	UG/L	17 U	
ANTIMONY	UG/L	14 U	
ARSENIC	UG/L	0 6 U	
BARIUM	UG/L	1 U	
BERYLLIUM	UG/L	1 U	
CADMIUM	UG/L	1 U	
CALCIUM	UG/L	99.8 J	
CHROMIUM, TOTAL	UG/L	13 =	
COBALT	UG/L	2 U	
COPPER	UG/L	2 U	
IRON	UG/L	84.8 J	
LEAD	UG/L	0 6 U	
MAGNESIUM	UG/L	31 U	
MANGANESE	UG/L	2 5 J	
MERCURY	UG/L	0 1 U	
NICKEL	UG/L	11 9 J	
POTASSIUM	UG/L	370 U	
SELENIUM	UG/L	0 4 U	
SILVER	UG/L	2 U	
SODIUM	UG/L	66 U	
THALLIUM	UG/L	0 24 J	
VANADIUM	UG/L	1 U	
ZINC	UG/L	3 3 J	
PCBs			
PCB-1016 (AROCHLOR 1016)	UG/L	1 U	
PCB-1221 (AROCHLOR 1221)	UG/L	2 U	
PCB-1232 (AROCHLOR 1232)	UG/L	1 U	
PCB-1242 (AROCHLOR 1242)	UG/L	1 U	
PCB-1248 (AROCHLOR 1248)	UG/L	1 U	
PCB-1254 (AROCHLOR 1254)	UG/L	1 U	
PCB-1260 (AROCHLOR 1260)	UG/L	1 U	
S DECACHLOROBIPHENYL	%	42 =	
Pesticides			
ALDRIN	UG/L	0.05 U	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
ALPHA ENDOSULFAN (ENDOSULFAN I)	UG/L	0.05 U	
ALPHA-CHLORDANE	UG/L	0.05 U	
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
BETA ENDOSULFAN (ENDOSULFAN II)	UG/L	0.1 U	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
DIELDRIN	UG/L	0.1 U	
ENDOSULFAN SULFATE	UG/L	0.1 U	
ENDRIN	UG/L	0.1 U	
ENDRIN ALDEHYDE	UG/L	0.1 U	
ENDRIN KETONE	UG/L	0.1 U	
GAMMA BHC (LINDANE)	UG/L	0 05 U	
GAMMA-CHLORDANE	UG/L	0.05 U	

StationID : CWM-1 FIELDQC
 SampleID : DFCWM001EB1 TRIP BLANK
 Date Collected : 06/21/2000 10/30/2000
 Time Collected : 12.00 PM 5.20 PM
 Sample Matrix : SQ WQ
 Sample Type : EB TB

Parameter	Units		
HEPTACHLOR	UG/L	0.05 U	
HEPTACHLOR EPOXIDE	UG/L	0.05 U	
METHOXYCHLOR	UG/L	0.5 U	
p,p'-DDD	UG/L	0.1 U	
p,p'-DDE	UG/L	0.1 U	
p,p'-DDT	UG/L	0.1 U	
TOXAPHENE	UG/L	5 U	
S 2,4,5,6-TETRACHLORO-META-XYLENE	%	98 =	
S DECACHLOROBIPHENYL	%	43 =	
SVOCs			
1,2,4-TRICHLOROBENZENE	UG/L	10 U	
1,2-DICHLOROBENZENE	UG/L	10 U	
1,3-DICHLOROBENZENE	UG/L	10 U	
1,4-DICHLOROBENZENE	UG/L	10 U	
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10 U	
2,4,5-TRICHLOROPHENOL	UG/L	25 U	
2,4,6-TRICHLOROPHENOL	UG/L	10 U	
2,4-DICHLOROPHENOL	UG/L	10 U	
2,4-DIMETHYLPHENOL	UG/L	10 U	
2,4-DINITROPHENOL	UG/L	25 U	
2,4-DINITROTOLUENE	UG/L	10 U	
2,6-DINITROTOLUENE	UG/L	10 U	
2-CHLORONAPHTHALENE	UG/L	10 U	
2-CHLOROPHENOL	UG/L	10 U	
2-METHYLNAPHTHALENE	UG/L	10 U	
2-METHYLPHENOL (o-CRESOL)	UG/L	10 U	
2-NITROANILINE	UG/L	25 U	
2-NITROPHENOL	UG/L	10 U	
3,3'-DICHLOROBENZIDINE	UG/L	10 U	
3-NITROANILINE	UG/L	25 U	
4,6-DINITRO-2-METHYLPHENOL	UG/L	25 U	
4-BROMOPHENYL PHENYL ETHER	UG/L	10 U	
4-CHLORO-3-METHYLPHENOL	UG/L	10 U	
4-CHLOROANILINE	UG/L	10 U	
4-CHLOROPHENYL PHENYL ETHER	UG/L	10 U	
4-METHYLPHENOL (p-CRESOL)	UG/L	10 U	
4-NITROANILINE	UG/L	25 U	
4-NITROPHENOL	UG/L	25 U	
ACENAPHTHENE	UG/L	10 U	
ACENAPHTHYLENE	UG/L	10 U	
ANTHRACENE	UG/L	10 U	
BENZO(a)ANTHRACENE	UG/L	10 U	
BENZO(a)PYRENE	UG/L	10 U	
BENZO(b)FLUORANTHENE	UG/L	10 U	
BENZO(g,h,i)PERYLENE	UG/L	10 U	
BENZO(k)FLUORANTHENE	UG/L	10 U	
BENZYL BUTYL PHTHALATE	UG/L	10 U	
bis(2-CHLOROETHOXY) METHANE	UG/L	10 U	

7041556

StationID : CWM-1 FIELDQC
 SampleID : DFCWM001EB1 TRIP BLANK
 Date Collected : 06/21/2000 10/30/2000
 Time Collected : 12:00 PM 5:20 PM
 Sample Matrix : SQ WQ
 Sample Type : EB TB

Parameter	Units		
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10 U	
bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10 U	
CARBAZOLE	UG/L	10 U	
CHRYSENE	UG/L	10 U	
DI-n-BUTYL PHTHALATE	UG/L	10 U	
DI-n-OCTYLPHTHALATE	UG/L	10 U	
DIBENZ(a,h)ANTHRACENE	UG/L	10 U	
DIBENZOFURAN	UG/L	10 U	
DIETHYL PHTHALATE	UG/L	0.9 J	
DIMETHYL PHTHALATE	UG/L	10 U	
FLUORANTHENE	UG/L	10 U	
FLUORENE	UG/L	10 U	
HEXACHLOROBENZENE	UG/L	10 U	
HEXACHLOROBUTADIENE	UG/L	10 U	
HEXACHLOROCYCLOPENTADIENE	UG/L	10 U	
HEXACHLOROETHANE	UG/L	10 U	
INDENO(1,2,3-c,d)PYRENE	UG/L	10 U	
ISOPHORONE	UG/L	10 U	
N-NITROSODI-n-PROPYLAMINE	UG/L	10 U	
N-NITROSODIPHENYLAMINE	UG/L	10 U	
NAPHTHALENE	UG/L	10 U	
NITROBENZENE	UG/L	10 U	
PENTACHLOROPHENOL	UG/L	5 U	
PHENANTHRENE	UG/L	10 U	
PHENOL	UG/L	10 U	
PYRENE	UG/L	10 U	
S 2,4,6-TRIBROMOPHENOL	%	90 =	
S 2-FLUOROBIPHENYL	%	88 =	
S 2-FLUOROPHENOL	%	96 =	
S NITROBENZENE-D5	%	86 =	
S PHENOL-D5	%	91 =	
S TERPHENYL-D14	%	85 =	
VOCs			
1,1,1-TRICHLOROETHANE	UG/L	10 U	1 U
1,1,2,2-TETRACHLOROETHANE	UG/L	10 U	1 U
1,1,2-TRICHLOROETHANE	UG/L	10 U	1 U
1,1-DICHLOROETHANE	UG/L	10 U	1 U
1,1-DICHLOROETHENE	UG/L	10 U	1 U
1,2-DICHLOROETHANE	UG/L	10 U	1 U
1,2-DICHLOROPROPANE	UG/L	10 U	1 U
2-HEXANONE	UG/L	10 U	5 U
ACETONE	UG/L	2 J	5 U
BENZENE	UG/L	10 U	1 U
BROMODICHLOROMETHANE	UG/L	10 U	1 U
BROMOFORM	UG/L	10 U	1 U
BROMOMETHANE	UG/L	10 U	1 U
CARBON DISULFIDE	UG/L	10 U	1 U
CARBON TETRACHLORIDE	UG/L	10 U	1 U

StationID : CWM-1 FIELDQC
 SampleID : DFCWM001EB1 TRIP BLANK
 Date Collected : 06/21/2000 10/30/2000
 Time Collected : 12.00 PM 5.20 PM

Parameter	Sample Matrix :	Sample Type :	Units
	SQ	WQ	
	EB	TB	
CHLOROBENZENE	UG/L	10 U	1 U
CHLOROETHANE	UG/L	10 U	1 U
CHLOROFORM	UG/L	10 U	1 U
CHLOROMETHANE	UG/L	10 U	1 U
cis-1,2-DICHLOROETHYLENE	UG/L		1 U
cis-1,3-DICHLOROPROPENE	UG/L	10 U	1 U
DIBROMOCHLOROMETHANE	UG/L	10 U	1 U
ETHYLBENZENE	UG/L	10 U	1 U
M,P-XYLENE (SUM OF ISOMERS)	UG/L		2 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10 U	5 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10 U	5 U
METHYLENE CHLORIDE	UG/L	0 3 J	0 3 J
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/L		1 U
STYRENE	UG/L	10 U	1 U
TETRACHLOROETHYLENE(PCE)	UG/L	10 U	1 U
TOLUENE	UG/L	10 U	1 U
TOTAL 1,2-DICHLOROETHENE	UG/L	10 U	
trans-1,2-DICHLOROETHENE	UG/L		1 U
trans-1,3-DICHLOROPROPENE	UG/L	10 U	1 U
TRICHLOROETHYLENE (TCE)	UG/L	10 U	1 U
VINYL CHLORIDE	UG/L	10 U	1 U
XYLENES, TOTAL	UG/L	10 U	
s 1-BROMO-4-FLUOROBENZENE (4-BROMOFLUOROBENZENE)	%	102 =	98 =
s DIBROMOFLUOROMETHANE	%	94 =	95 =
s TOLUENE-D8	%	105 =	100 =

MG/L - milligrams per liter
 UG/L - micrograms per liter
 'U' - not detected
 '=' - detected concentration
 'J' - estimated value
 'R' - rejected value
 s - surrogate
 EB - equipment blank
 TB - trip blank

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE