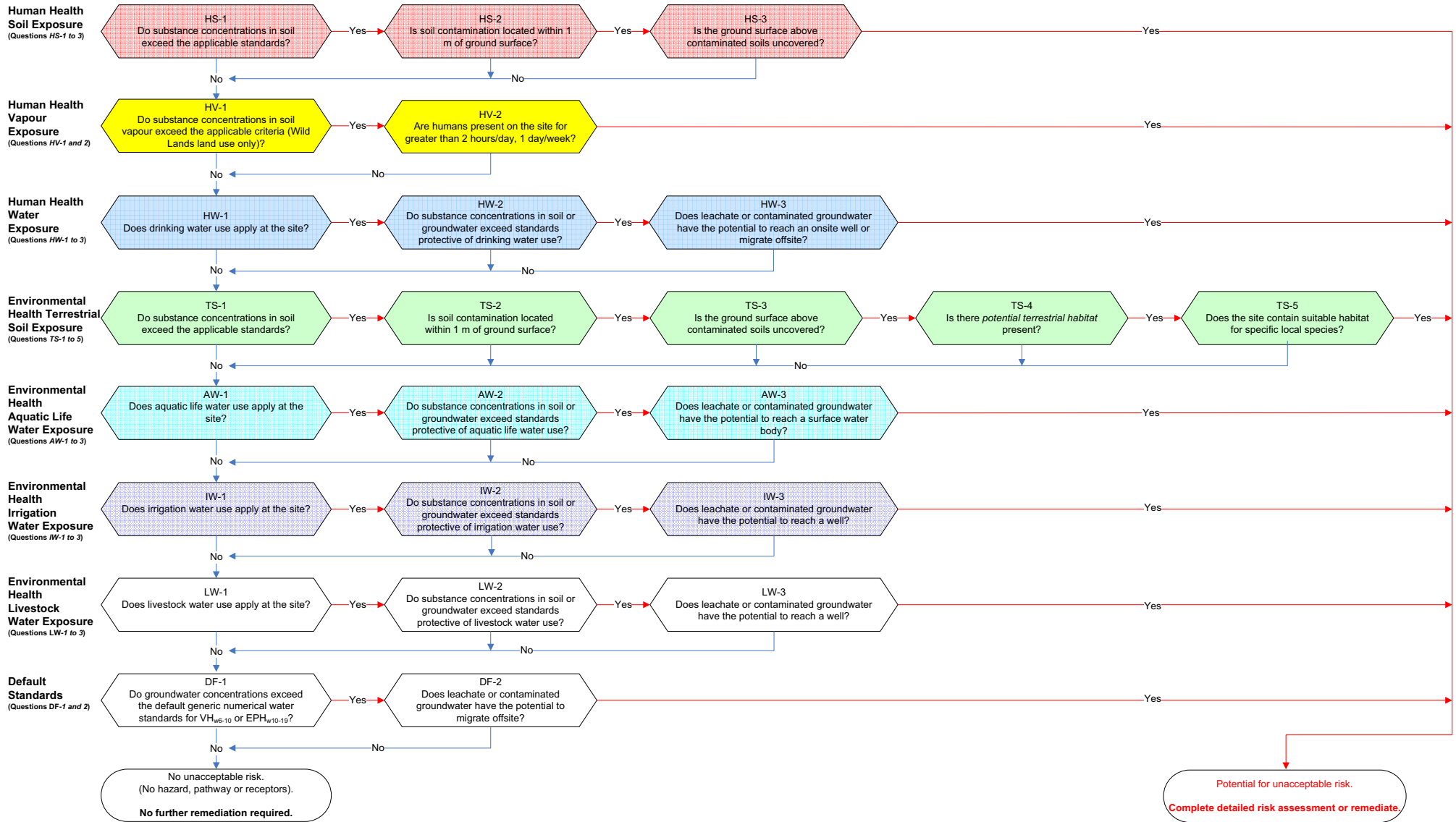


FIGURE 1. Screening Level Risk Assessment Flowchart.

(Note: This flowchart is provided for illustrative purposes only. The questionnaire included in SLRA must be completed and takes precedence over this flowchart).



**HEALTH CANADA DQRA SPREADSHEET
USER INPUT SHEET**

User Name:
 Proponent:
 Date:

Site:
 File #:
 Comment:

PROBLEM FORMULATION

Potential Land Uses (Yes/No) Default

Agricultural	<input type="text"/>	Yes
Residential/urban parkland	<input type="text"/>	Yes
Commercial	<input type="text"/>	Yes
Industrial	<input type="text"/>	Yes
Occupational - Outdoors	<input type="text"/>	Yes
Recreational	<input type="text"/>	Yes
Other	<input type="text"/>	No

specify:

Operative Pathways (Yes/No) Default

Inadvertent ingestion of soil	<input type="text"/>	Yes
Inhalation of soil particles	<input type="text"/>	Yes
Inhalation of indoor contaminant vapours	<input type="text"/>	Yes
Inhalation of outdoor contaminant vapours	<input type="text"/>	Yes
Ingestion of drinking water	<input type="text"/>	Yes
Dermal contact with soil	<input type="text"/>	Yes
Dermal contact with water	<input type="text"/>	Yes
Ingestion of contaminated food	<input type="text"/>	No

Exposure Scenario Agricultural

Vapour Transport Modelling

Vapour source for exposure calculations	<input type="text"/>	Most Conservative
Model applied for soil to indoor air	<input type="text"/>	Health Canada
Model applied for groundwater to indoor air	<input type="text"/>	Health Canada
Model applied for soil vapour to indoor air	<input type="text"/>	Health Canada

Receptor Groups (Yes/No) Default

General public or residents	<input type="text"/>	Yes
Employees	<input type="text"/>	Yes
Canadian native communities	<input type="text"/>	No
Other	<input type="text"/>	No

specify:

Active Critical Receptors (Yes/No) Default

Infant	<input type="text"/>	Yes
Toddler	<input type="text"/>	Yes
Child	<input type="text"/>	Yes
Teen	<input type="text"/>	Yes
Adult	<input type="text"/>	Yes
Other	<input type="text"/>	No

specify:

Contaminant Concentrations

Chemical Name	required
Soil (mg/kg)	required
Mole Fraction in Soil (unitless)	optional
Groundwater - source (mg/L)	optional
Mole Fraction in Groundwater (unitless)	optional
Drinking water (mg/L)	optional
Bathing/swimming water (mg/L)	optional
Indoor air - vapours (mg/m ³)	optional
Outdoor air - vapours (mg/m ³)	optional
Outdoor air - particulate (mg/m ³)	optional
Soil vapours (> 1 m below foundation) (mg/m ³)	optional
Subslab/shallow soil vapour (<1 m) (mg/m ³)	optional
Root vegetables (mg/kg wet weight)	optional
Other vegetables (mg/kg wet weight)	optional
Fish (mg/kg wet weight)	optional
Wild game (mg/kg wet weight)	optional

Chemical Name	Arsenic	naphthalene				
Soil (mg/kg)	56	14				
Mole Fraction in Soil (unitless)						
Groundwater - source (mg/L)						
Mole Fraction in Groundwater (unitless)						
Drinking water (mg/L)						
Bathing/swimming water (mg/L)						
Indoor air - vapours (mg/m ³)						
Outdoor air - vapours (mg/m ³)						
Outdoor air - particulate (mg/m ³)						
Soil vapours (> 1 m below foundation) (mg/m ³)						
Subslab/shallow soil vapour (<1 m) (mg/m ³)						
Root vegetables (mg/kg wet weight)						
Other vegetables (mg/kg wet weight)						
Fish (mg/kg wet weight)						
Wild game (mg/kg wet weight)						

Risk Assessment Endpoints Default

Acceptable hazard index: 0.2

Acceptable cancer risk: 1.00E-05

Precluding Conditions for Fate and Transport Models

Are non-aqueous phase liquids (NAPL) present?

Is groundwater contamination present in fractured bedrock?

Is groundwater contamination migrating through a confined aquifer?

Is there active pumping or drawdown of groundwater at the site?

All precluding conditions questions should be answered

Is contamination present within 1 m of building foundation?
 Do any buildings within 5 m of contamination have earthen foundations?
 Are any buildings constructed on very high permeability media?
 Are there preferential vapour flow pathways connecting contamination to a building?

Fate and Transport Model Input

	Value	Default	Models Affected
<i>Soil Type</i>		coarse-grained	PS, V-H, V-C, V-O, GW
<i>Significant vehicle traffic on unpaved roads?</i>		No	P-O
<i>Site Characteristics</i>			
Source Length (m)		10	GW, V-O
Source Width (m)		10	GW, V-O
Depth to Groundwater (m)		3	GW, V-O
Depth from Surface to Contamination (m)		0	GW, V-O
Thickness of Contamination (m)		3	GW
Distance - Contaminated Soil to Building (m)		1	V-H, V-C
Distance - Contaminated GW to Building (m)		1	V-H, V-C
Depth Below Building to Vapour Sample (m)		1	V-H, V-C
Distance to potable water user (m)		0	GW
Distance to Bathing/Swimming Water (m)		0	GW
Particulate Concentration in Air (ug/m ³)		0.76	P-O
<i>Hydrological Parameters</i>			
Recharge (m/y)		0.28	GW
<i>Soil/Groundwater Characteristics</i>			
coarse-grained			
<u>Vadose Zone</u>			
Dry Bulk Density (g/cm ³)		1.700	PS, V-C
Water Content (g/g dry wt)		0.070	PS, V-C
<u>Capillary Zone</u>			
Thickness of Capillary Zone (cm)		5	V-C
Water Content (g/g dry wt)		0.070	V-C
<u>Aquifer/Contaminated Zone</u>			
Saturated Hydraulic Conductivity (m/y)		320	GW
Hydraulic Gradient (m/m)		0.028	GW
Organic Carbon Fraction (g/g)		0.005	PS, GW
Soil Temperature (°C)		21	PS, PGW
Depth of unconfined aquifer (m)		5	GW
<i>Vapour Transport Properties</i>			
Soil Vapour Permeability (cm ²) - CCME model		6.00E-08	V-C
<i>Building Type</i>			
		Residential - Slab on Grade	V-H, V-C
<i>Building Characteristics</i>			
Residential - Slab on Grade			
Building length (m)		12.25	V-C
Building width (m)		12.25	V-C
Building mixing height (m)		3.6	V-H, V-C
Thickness of building foundation (cm)		11.25	V-C
Depth to base of foundation (m)		0.1125	V-C
Air exchanges per hour		0.5	V-C
Pressure differential (Pa)		40	V-C
Crack Area (cm ²)		994.5	V-C
<i>Additional Vapour Intrusion Parameters (Health Canada model)</i>			
Apply biodegradation adjustment?		No	V-H
Apply groundwater mass flux check?		No	V-H
Apply source depletion check?		No	V-H

Additional Groundwater Model Parameters
Apply biodegradation during transport?

No

GW

Optional Sections

User-defined Chemicals

Note: user-defined chemicals should be named in this section before being selected in the 'Contaminant Concentrations' table above

	Chemical 1	Chemical 2	Chemical 3
Name			
CAS Number			
Chemical class (organic/inorganic)			
Tolerable daily intake (mg/kg/d) - infant			
Tolerable daily intake (mg/kg/d) - toddler			
Tolerable daily intake (mg/kg/d) - child			
Tolerable daily intake (mg/kg/d) - teen			
Tolerable daily intake (mg/kg/d) - adult			
Tolerable concentration (mg/m ³)			
Oral slope factor (mg/kg/d) ⁻¹			
Inhalation slope factor (mg/kg/d) ⁻¹			
Inhalation unit risk (mg/m ³) ⁻¹			
Relative dermal absorption factor			
Organic carbon partitioning coefficient (mL/g) - Koc			
Log Kow (unitless)			
Henry's Law constant at 25°C (unitless) - H'			
Henry's Law constant at 25°C (atm-m ³ /mol) - H			
Water Solubility at 25°C (mg/L)			
Molecular Weight (g/mol)			
Diffusivity in air (cm ² /s)			
Diffusivity in water (cm ² /s)			
Vapour Pressure at 25°C (atm)			
Normal Boiling Point (K) - optional			
Critical Temperature (K) - optional			
Enthalpy of Vaporization @ Boiling Point (cal/mol) - optional			
Biodegradation Adjustment Factor (unitless)			
Half-Life - unsaturated zone (days)			
Half-Life - saturated zone (days)			

Enter all applicable and appropriate toxicity benchmarks; values must be referenced and justified in the PQRA report.

Note: values in grayed cells will not be used; Health Canada default values are applied.

User-defined Receptor

Name	Defaults
Age group	Toddler
Body weight (kg)	16.5
Soil ingestion rate (g/d)	0.08
Inhalation rate (m ³ /d)	9.3
Water ingestion rate (L/d)	0.6
Skin surface area (cm ²)	
- hands	430
- arms	890
- legs	1690
- total	6130
Soil loading to exposed skin (g/cm ² /event)	
- hands	0.0001
- surfaces other than hands	0.00001
Food ingestion (g/d)	
- root vegetables	105
- other vegetables	67
- fish	56
- wild game	0
Evaluate Cancer Risks (Yes/No)?	No

User-defined Land-Use / Exposure Scenario

Scenario name	User-Defined	Defaults
Hours per day (indoors)		22.5
Hours per day (outdoors)		1.5
Days per week		7
Weeks per year		52
Dermal exposure events/day		1
Water contact events per day		1
Duration of water contact event (h)		1
Days/year contaminated food ingestion		365
Exposure duration (years)		60
Years for carcinogen amortization		60

SUMMARY OF DQRA RESULTS

Version: March 16, 2009

User Name:
Proponent:
Date:

Site:
File #:
Comment:

		Maximum Hazard/Risk Estimates				
		Arsenic	naphthalene			
Hazard Quotient - Oral/Dermal		NA	3.03E+00	NA	NA	NA
Hazard Quotient - Inhalation		NA	2.85E+01	NA	NA	NA
Hazard Index - Total		NA	3.15E+01	NA	NA	NA
Target Hazard Index:	0.2	Target Hazard Index Exceeded				
Cancer Risk - Oral		2.85E-05	NA	NA	NA	NA
Cancer Risk - Dermal		7.32E-06	NA	NA	NA	NA
Cancer Risk - Oral + Dermal		3.58E-05	NA	NA	NA	NA
Cancer Risk - Inhalation		1.70E-08	NA	NA	NA	NA
Cancer Risk - Total		3.59E-05	NA	NA	NA	NA
Target Cancer Risk:	1.00E-05	Target Cancer Risk Exceeded				

		Critical Receptors				
		Arsenic	naphthalene			
Oral/Dermal - non-cancer effects		NA	Infant	NA	NA	NA
Inhalation - non-cancer effects		NA	All Age Groups	NA	NA	NA
Total - non-cancer effects		NA	Infant	NA	NA	NA
Oral - cancer effects		Adult	NA	NA	NA	NA
Dermal - cancer effects		Adult	NA	NA	NA	NA
Oral + Dermal - cancer effects		Adult	NA	NA	NA	NA
Inhalation - cancer effects		Adult	NA	NA	NA	NA
Total - cancer effects		Adult	NA	NA	NA	NA
Source of indoor air vapours		NA	Soil	NA	NA	NA
Model used for vapour transport		NA	Health Canada	NA	NA	NA

Key Calculated Model Parameters						
Vapour Intrusion Model Parameters		Note: parameters show as "NA" if relevant exposure pathways are inoperative or if user-input concentration is used instead of modelled value				
Qsoil/Qbuilding		2.22E-03	2.22E-03	NA	NA	NA
Soil alpha		2.83E-03	2.83E-03	NA	NA	NA
Groundwater alpha		1.06E-03	1.06E-03	NA	NA	NA
Soil vapour alpha		2.83E-03	2.83E-03	NA	NA	NA
Groundwater model dilution factors						
DF1 (soil to leachate)		NA	5.68E+00	NA	NA	NA
DF2 (leachate at source to water table):		NA	1.00E+00	NA	NA	NA
DF3 (leachate at water table to groundwater):		NA	3.36E+00	NA	NA	NA
DF4 (source to receptor) - drinking water:		NA	1.00E+00	NA	NA	NA
DF4 (source to receptor) - bathing/swimming water:		NA	1.00E+00	NA	NA	NA

Notes/Comments

Vapour Intrusion Model

Chemical Interactions

All chemicals of concern present at the site should be evaluated for potential additive effects based on target organs and mechanisms of effect.

Concentration Checks

Precluding Conditions

Other Notes

HEALTH CANADA DQRA SPREADSHEET
OUTPUT SHEET - TODDLER

Version: March 16, 2009

User Name:
Proponent:
Date:

Site:
File #:
Comment:

Exposure Scenario: Agricultural
Native population not considered

Chemical Properties	Units	Arsenic	naphthalene				
Tolerable daily intake	mg/kg/d	NA	0.02	NA	NA	NA	NA
Tolerable concentration	mg/m ³	NA	0.003	NA	NA	NA	NA
Relative dermal absorption factor	unitless	0.03	0.13	1	1	1	1

Chemical Concentrations	Units	Arsenic	naphthalene				
Soil	mg/kg	5.60E+01	1.40E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Drinking water	mg/L	0.00E+00	7.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bathing/swimming water	mg/L	0.00E+00	7.34E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indoor air vapours	mg/m ³	0.00E+00	9.12E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Outdoor air vapours	mg/m ³	0.00E+00	2.85E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Outdoor air particulate	mg/m ³	4.26E-08	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Amortized total air concentration	mg/m ³	2.66E-09	8.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Root vegetables	mg/kg wet wt	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated
Other vegetables	mg/kg wet wt	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated
Fish	mg/kg wet wt	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated
Wild game	mg/kg wet wt	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated	not evaluated

RESULTS

	Exposure (mg/kg/d)					
	Arsenic	naphthalene				
Inadvertent ingestion of contaminated soil	2.72E-04	6.79E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation of contaminated soil particles	1.50E-09	3.70E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation of contaminant vapours - indoor	0.00E+00	4.82E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inhalation of contaminant vapours - outdoor	0.00E+00	1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ingestion of contaminated drinking water	0.00E+00	2.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dermal contact with contaminated soil	7.01E-06	7.59E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dermal contact with water	0.00E+00	2.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ingestion of contaminated food	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion exposure	2.72E-04	2.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total dermal exposure	7.01E-06	2.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ingestion + dermal exposure	2.79E-04	5.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total inhalation exposure	1.50E-09	4.82E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Exposure (all pathways)	2.79E-04	1.03E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Hazard/Risk Estimates					
	Arsenic	naphthalene				
Hazard Quotient - Oral/Dermal	NA	2.76E+00	NA	NA	NA	NA
Hazard Quotient - Inhalation	NA	2.85E+01	NA	NA	NA	NA
Hazard Index - Total	NA	3.13E+01	NA	NA	NA	NA
Target Hazard Index: 0.2		Target Hazard Index Exceeded				

FATE AND TRANSPORT MODEL CALCULATION SHEET - PQRA VAPOUR INTRUSION MODEL

INPUT PARAMETERS

Soil Properties at Vapour Contamination Source

Parameter (from input sheet)	Symbol	Unit	Value
Soil Type		dimensionless	coarse-grained
Total Porosity - calculated	θ	dimensionless	0.36
Water-Filled Porosity - calculated	θ_w	dimensionless	0.12
Air-Filled Porosity - calculated	θ_a	dimensionless	0.24
Organic Carbon Fraction	foc	kg OC/kg soil	0.005
Soil Dry Bulk Density	ρ	kg/L	1.7
Darcy Velocity	Y	m/y	9.0
Soil Temperature	T	°C	21

Building Dimensions

Building Dimensions (from input sheet)	Symbol	Unit	Value
Building length		(m)	12.25
Building width		(m)	12.25
Building mixing height		(m)	3.6
Mixing height adjustment factor		dimensionless	1
Building air exchange rate		exch/h	0.5
Air exchange adjustment factor		dimensionless	1
Depth to foundation slab		(m)	0.1125
Building footprint area - calculated		(m ²)	1.50E+02
Building volume - calculated	V _b	(m ³)	5.40E+02

Vapour Migration Distances

Parameter (calculated)	Unit	Value
Soil Contamination to Foundation	m	1
Groundwater Contamination to Foundation	m	1
Soil Vapour Sample to Foundation	m	1

Chemical Properties

Parameter (from chemical sheet)	Symbol	Unit	Arsenic	naphthalene				
log(K _{oc})	log K _{oc}	mL/g		3.05E+00				
Henry's Law Constant	H	atm-m ³ /mole		4.24E-04				
Henry's Law Constant Reference Temperature	TR _{H,R}	K	2.98E+02	2.98E+02	2.98E+02	2.98E+02	2.98E+02	2.98E+02
Water Solubility	S	g/m ³ (25°C)		3.10E+01				
Biodegradation Adjustment Factor		dimensionless	1.00E+00	1.00E+01				
Molecular Weight	MW	g/mole	7.80E+01	1.28E+02				
Vapour Pressure	V	atm		1.03E-04				
Vapour Pressure Reference Temperature	TR _{V,R}	K	2.98E+02	2.98E+02	2.98E+02	2.98E+02	2.98E+02	2.98E+02
Normal Boiling Point	T _B	K	8.76E+02	4.91E+02				
Critical Temperature	T _C	K		7.48E+02				
Enthalpy of Vaporization at Normal Boiling Point	DH _{v,b}	cal/mol		1.04E+04				

Constants

Parameter	Symbol	Unit	Value
Gas Constant	R3	m ³ -atm/K-mol	8.21E-05
Gas Constant	R1	J/mol-K	8.31E+00
Gas Constant	R2	cal/K-mol	1.99E+00

CALCULATIONS

Temperature Corrected Henry's Law Constant

Parameter	Symbol	Unit	Arsenic	naphthalene				
Method 1								
Dimensionless H' for 25°C	H'ts	dimensionless	Missing Data	1.73E-02	Missing Data	Missing Data	Missing Data	Missing Data
Method 2								
Tb/Tc Factor	Tb/Tc	dimensionless	Missing Data	6.56E-01	Missing Data	Missing Data	Missing Data	Missing Data
n Factor	n	dimensionless	Missing Data	3.70E-01	Missing Data	Missing Data	Missing Data	Missing Data
Enthalpy of Vaporization at average soil temp	ΔH_{1b}	cal/mol	Missing Data	1.28E+04	Missing Data	Missing Data	Missing Data	Missing Data
Temperature Corrected H'	H'ts	dimensionless	Missing Data	1.31E-02	Missing Data	Missing Data	Missing Data	Missing Data
Temperature Corrected H' - Value Used	H'ts	dimensionless	Missing Data	1.31E-02	Missing Data	Missing Data	Missing Data	Missing Data

Temperature Corrected Vapour Pressure

Parameter	Symbol	Unit	Arsenic	naphthalene				
Enthalpy of Vaporization at Normal Boiling Point	ΔH_1	J/mole	Missing Data	4.34E+04	Missing Data	Missing Data	Missing Data	Missing Data
Temperature Corrected Vapour Pressure	P'	atm	Missing Data	8.02E-05	Missing Data	Missing Data	Missing Data	Missing Data

Vapour Pressure - Value Used	P'	atm	8.02E-05
------------------------------	----	-----	----------

Soil Vapour Concentration Predicted from Soil Concentration

Parameter	Symbol	Unit	Arsenic	naphthalene				
Soil Concentration (input sheet)	C _s	mg/kg	5.60E+01	1.40E+01	Missing Data	Missing Data	Missing Data	Missing Data
Mole Fraction (input sheet)	X	dimensionless	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Soil Saturation Concentration	C _{sat}	mg/kg	Missing Data	1.76E+02	Missing Data	Missing Data	Missing Data	Missing Data
Max Theoretical Soil Vapour Concentration	C _v ^{max}	mg/m ³ or ug/L	Missing Data	4.26E+02	Missing Data	Missing Data	Missing Data	Missing Data
Soil Vapour Concentration, 3-phase model	C _v ^{3-phase}	mg/m ³ or ug/L	Missing Data	3.23E+01	Missing Data	Missing Data	Missing Data	Missing Data
Soil Vapour Concentration	C _v	mg/m ³ or ug/L	Missing Data	3.23E+01	Missing Data	Missing Data	Missing Data	Missing Data
No Source Depletion Adjustment								
Soil Alpha	α _g	dimensionless	2.83E-03	2.83E-03	2.83E-03	2.83E-03	2.83E-03	2.83E-03
Predicted Indoor Air Concentration	C _{air}	mg/m ³	Missing Data	9.12E-02	Missing Data	Missing Data	Missing Data	Missing Data
Source Depletion Adjustment								
Thickness contaminated zone (input sheet)	T _s	m	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
Volume Building	V _b	m ³	5.40E+02	5.40E+02	5.40E+02	5.40E+02	5.40E+02	5.40E+02
Ventilation Rate	VR	m ³ /min	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
Flux per Unit Area Building	Flux _v	mg/min-m2	Missing Data	2.74E-03	Missing Data	Missing Data	Missing Data	Missing Data
Contamination Mass per Unit Area Building	Mass _a	mg/m2	2.86E+05	7.14E+04	Missing Data	Missing Data	Missing Data	Missing Data
Time for Contamination Source Depletion	Time _d	years	Missing Data	4.97E+01	Missing Data	Missing Data	Missing Data	Missing Data
Total years exposed (carcinogens only)	D4	years	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
Adjusted Predicted Indoor Air Concentration	C _{air} '	mg/m ³	Missing Data	7.55E-02	Missing Data	Missing Data	Missing Data	Missing Data
Final Predicted Indoor Air Concentration (dose or air concentration amortized over exposure duration)	C _{air}	mg/m ³	Missing Data	9.12E-02	Missing Data	Missing Data	Missing Data	Missing Data

Soil Vapour Concentration Above Water Table Predicted from Groundwater Concentration

Parameter	Symbol	Unit	Arsenic	naphthalene				
Groundwater Concentration (input sheet)	C _g	mg/L	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Mole Fraction (input sheet)	X	dimensionless	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Effective Solubility	C _{sol}	mg/L	Missing Data	3.10E+01	Missing Data	Missing Data	Missing Data	Missing Data
Max Theoretical Soil Vapour Concentration	C _v ^{max}	mg/m ³ or ug/L	Missing Data	4.26E+02	Missing Data	Missing Data	Missing Data	Missing Data
Soil Vapour Concentration	C _v	mg/m ³ or ug/L	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
No Groundwater Mass Flux Adjustment								
Groundwater Alpha	α _g	dimensionless	1.06E-03	1.06E-03	1.06E-03	1.06E-03	1.06E-03	1.06E-03
Predicted Indoor Air Concentration	C _{air}	mg/m ³	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Groundwater Mass Flux Adjustment								
Darcy Velocity (Specific Discharge)	U	m/year	8.96E+00	8.96E+00	8.96E+00	8.96E+00	8.96E+00	8.96E+00
Volume Building	V _b	m ³	5.40E+02	5.40E+02	5.40E+02	5.40E+02	5.40E+02	5.40E+02
Ventilation Rate	VR	m ³ /min	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
Volatilization Flux	Flux _v	mg/min	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Groundwater Flux	Flux _g	mg/min	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Adjusted Groundwater Alpha	α _g '	dimensionless	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Adjusted Predicted Indoor Air Concentration	C _{air} '	mg/m ³	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Final Predicted Indoor Air Concentration	C _{air}	mg/m ³	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data

Measured Soil Vapour Concentration

Parameter	Symbol	Unit	Arsenic	naphthalene				
Soil Vapour Concentration	C _v	mg/m ³ or ug/L	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Soil Alpha	α _g	dimensionless	2.83E-03	2.83E-03	2.83E-03	2.83E-03	2.83E-03	2.83E-03
Predicted Indoor Air Concentration	C _{air}	mg/m ³	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data

Measured Subslab/Shallow Soil Vapour Concentration

Parameter	Symbol	Unit	Arsenic	naphthalene				
Subslab Vapour Concentration	C _v	mg/m ³ or ug/L	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
Soil Alpha	α _g	dimensionless	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02
Predicted Indoor Air Concentration	C _{air}	mg/m ³	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data

	Symbol	Unit	Arsenic	naphthalene				
Applied Indoor Air Concentration	C _{air}	mg/m ³	0	0.091187573	0	0	0	0
Source			NA	Soil	NA	NA	NA	NA

CALCULATION OF ALPHA

Soil Classification

sand

Vapour Attenuation Factor ("alpha" = 1/dilution factor)

Vapour attenuation factor (Residential) - **Calculated**

Vapour attenuation factor (Commercial) - **Calculated**

Vapour Attenuation Factor ("alpha" = 1/dilution factor)

Adjustment for Biodegradation (optional)

Building eligible for biodegradation adjustment?

Min dist. (m)

10X

Adjustment for Building Height (optional) - Currently Not Allowed

Adjusted Vapour Attenuation Ratio - **Calculated**

Adjustment for Building Ventilation Rate (optional)

Adjusted Vapour Attenuation Ratio - **Calculated**

Final Vapor Attenuation Ratio Used for Calculations

Attenuation Ratios from CCME Model

Arsenic
naphthalene

Groundwater	Soil Vapour	Soil
1.06E-03	2.83E-03	2.83E-03
2.05E-04	3.74E-04	3.74E-04

1.06E-03	2.83E-03	2.83E-03
----------	----------	----------

3	3	1
No	No	No

No biodegradation adjustments applied

1.06E-03 2.83E-03 2.83E-03

1.06E-03 2.83E-03 2.83E-03

Groundwater	Soil Vapour	Soil
1.06E-03	2.83E-03	2.83E-03

	Groundwater	Soil Vapour	Soil
	NA	NA	NA
	4.86E-04	4.86E-04	4.86E-04
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

Calculated Alpha Values

Source	Scenario	Soil Type	Alpha		
Groundwater	Residential	sand (coarse-grained)	0.00106		
		loamy sand	0.000515		
		sandy loam	0.000157		
	Commercial	loam (fine-grained)	0.000101		
		sand (coarse-grained)	0.000205		
		loamy sand	0.0000958		
		sandy loam	0.0000397		
		loam (fine-grained)	0.0000263		
		Soil Vapour	Residential	sand (coarse-grained)	0.002825
				loamy sand	0.00266
sandy loam	0.00228				
Commercial	loam (fine-grained)		0.00175		
	sand (coarse-grained)		0.000374		
	loamy sand		0.000363		
	sandy loam		0.000334		
	loam (fine-grained)		0.000286		
	Soil		Residential	sand (coarse-grained)	0.002825
				loamy sand	0.00266
sandy loam		0.00228			
Commercial		loam (fine-grained)	0.00175		
		sand (coarse-grained)	0.000374		
		loamy sand	0.000363		
		sandy loam	0.000334		
		loam (fine-grained)	0.000286		

RECEPTOR CHARACTERISTICS

Receptor	Infant	Toddler	Child	Teen	Adult	User-defined
Active?	Yes	Yes	Yes	Yes	Yes	No
Age	0 - 6 mo.	7 mo. - 4 y	5 - 11 y	12 - 19 y	>= 20 y	
Body weight (kg)	8.2	16.5	32.9	59.7	70.7	16.5
Soil ingestion rate (g/d)	0.02	0.08	0.02	0.02	0.02	0.08
Inhalation rate (m3/d)	2.1	9.3	14.5	15.8	15.8	9.3
Water ingestion rate (L/d)	0.3	0.6	0.8	1	1.5	0.6
Skin surface area (cm2)						
- hands	320	430	590	800	890	430
- arms	550	890	1480	2230	2500	890
- legs	910	1690	3070	4970	5720	1690
- total	3620	6130	10140	15470	17640	6130
Soil loading to exposed skin (g/cm2/event)						
- hands	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	0.0001
- surfaces other than hands	1.00E-05	1.00E-05	1.00E-05	1.00E-05	1.00E-05	0.00001
Food ingestion (g/d)						
- root vegetables	83	105	161	227	188	105
- other vegetables	72	67	98	120	137	67
- fish	0	56	90	104	111	56
Native food ingestion (g/d)						
- fish	0	95	170	200	220	56
- wild game	0	85	125	175	270	0

Native population considered? Not Specified

EXPOSURE SCENARIOS

Scenario	Occupational -							Applied
	Agricultural	Residential	Commercial	Industrial	Outdoors	Recreational	User-Defined	
Hours per day (indoors)	22.5	22.5	8	8	0	2	NA	22.5
Hours per day (outdoors)	1.5	1.5	0	0	8	2	NA	1.5
Days per week	7	7	5	5	5	2	NA	7
Weeks per year	52	52	52	48	48	35	NA	52
Dermal exposure events per day	1	1	1	1	1	1	NA	1
Water contact events per day	1	1	1	1	1	1	NA	1
Duration of water contact event (h)	1	1	1	1	1	1	NA	1
Days/year of contaminated food ingestion	365	365	365	365	365	70	NA	365
Exposure Duration (years)	60	60	60	60	60	60	NA	60
Years for carcinogen amortization	60	60	60	60	60	60	NA	60

Target Hazard Quotient: 0.2
Target Cancer Risk: 0.00001

SOIL TYPES

Parameter	Units	coarse-grained	fine-grained	sand	loamy sand	sandy loam	loam
<i>Hydrological Parameters</i>							
Recharge	m/y	0.28	0.2	0.28	0.28	0.28	0.28
<i>Soil/Groundwater Characteristics</i>							
Bulk Density	g/cm3	1.7	1.4	1.66	1.62	1.62	1.59
Water Content - Vadose Zone	g/g	0.07	0.12	0.03	0.05	0.06	0.09
Soil Porosity	cm3/cm3	0.358	0.472	0.375	0.39	0.387	0.399
Water-filled Porosity - Vadose Zone	cm3/cm3	0.119	0.168	0.054	0.076	0.103	0.148
Air-filled Porosity - Vadose Zone	cm3/cm3	0.239	0.304	0.321	0.314	0.284	0.251
Capillary Zone Thickness	cm	5	30	17	18.8	25	37.5
Water Content - Capillary Zone	g/g	0.07	0.12	0.15	0.19	0.20	0.21
Water-filled Porosity - Capillary Zone	cm3/cm3	0.119	0.168	0.253	0.303	0.32	0.332
Air-filled Porosity - Capillary Zone	cm3/cm3	0.239	0.304	0.122	0.087	0.067	0.067
Saturated Hydraulic Conductivity	m/y	320	32	2348	384	140	44
Hydraulic Gradient	m/m	0.028	0.028	0.028	0.028	0.028	0.028
Organic Carbon Fraction	g/g	0.005	0.005	0.005	0.005	0.005	0.005
Depth of unconfined aquifer	m	5	5	5	5	5	5
<i>Vapour Transport Properties</i>							
Soil Vapour Permeability (CCME Model)	cm2	6.00E-08	1.00E-09	8.00E-08	1.45E-08	5.30E-09	1.71E-09

These soil types not available for use at this time

clay	clay loam	silt	silt loam	silty clay	silty clay loam	sandy clay	sandy clay loam
0.2	0.2	0.2	0.2	0.2	0.2	0.28	0.28
1.43	1.48	1.35	1.49	1.38	1.37	1.63	1.63
0.15	0.11	0.12	0.12	0.16	0.14	0.12	0.09
0.459	0.442	0.489	0.439	0.481	0.482	0.385	0.384
0.215	0.168	0.167	0.18	0.216	0.198	0.197	0.146
0.244	0.274	0.322	0.259	0.265	0.284	0.188	0.238
81.5	46.9	163	68.2	192	133.9	30	25.9
0.29	0.25	0.28	0.23	0.31	0.29	0.22	0.20
0.412	0.375	0.382	0.349	0.424	0.399	0.355	0.333
0.047	0.067	0.107	0.09	0.057	0.083	0.03	0.051
53	30	160	67	35	40	41	48
0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5	5	5	5	5	5	5	5
2.22E-09	1.20E-09	6.06E-09	2.60E-09	1.49E-09	1.65E-09	1.77E-09	1.89E-09

Values for coarse-grained and fine-grained soils from CCME (2006; 2007 draft)

All other values from US EPA J&E model, except recharge, hydraulic gradient, organic carbon fraction and depth of unconfined aquifer (CCME values applied based on whether soil type is classified as coarse or fine)

Values for menus:

Yes No
CCME Health Can

Most ConsrSoil VapouSubslab (s/ Groundwat Soil

Missing Data
equally dist user-specified
organic inorganic
Residential Residential Commercial/Industrial
Water Cont Water Cont Water-filled Saturation (fraction)
Dry Bulk Dt Total Porosity (dimensionless)

CHEMICALS

Non-Carcinogenic Toxicological Reference Values

Carcinogenic Toxicological Reference Values^a

Name	CAS Number	Chemical Class	TDI - Infant	TDI - Toddler	TDI - Child	TDI - Teen	TDI - Adult	Tolerable Concentration	Oral slope factor	Inhalation slope factor	Inhalation unit risk	Source of TRVs	Relative Dermal Absorption Factor	Reference	Log Koc	Reference
Units of Measurement			mg/kg-d	mg/kg-d	mg/kg-d	mg/kg-d	mg/kg-d	mg/m3	(mg/kg-d)-1	(mg/kg-d)-1	(mg/m3)-1		(unitless)		(L/Kg)	
User-defined chemical 1																
User-defined chemical 2																
User-defined chemical 3																
F1		mixture											0.2			
F2		mixture											0.2			
F3		mixture											0.2			
F4		mixture											0.2			
2,4-D	94-75-7	organic	0.003	0.003	0.003	0.003	0.003					HC1			2.21	16(1)
Aldicarb	116-06-3	organic	0.001	0.001	0.001	0.001	0.001					HC1			1.48	1
Aldrin	309-00-2	organic	0.0001	0.0001	0.0001	0.0001	0.0001					HC1	0.1	HC1	2.61	1
Aniline	62-53-3	organic	0.007	0.007	0.007	0.007	0.007					HC1			1.93	16(1)
Anthracene	120-12-7	organic	0.3	0.3	0.3	0.3	0.3		0.23	0.0137	0.0031	IRIS/HC2	0.13	HC1	4.40	16(1)
Arsenic	7440-38-2	inorganic							1.8	28	6.4	HC1	0.03	HC1	NA	
Atrazine + metabolites	1912-24-9	organic	0.006	0.006	0.006	0.006	0.006					HC1			2	1
Azinphos-methyl	86-50-0	organic	0.0015	0.0015	0.0015	0.0015	0.0015					HC1			2.61	1
Barium	7440-39-3	inorganic	0.016	0.016	0.016	0.016	0.016					HC1	0.1	HC1	NA	
Bendiocarb	22781-23-3	organic	0.004	0.004	0.004	0.004	0.004					HC1			2.76	1
Benz[a]anthracene	56-55-3	organic							0.23	0.0137	0.0031	HC2	0.13	HC1	5.79	16(1)
Benzene	71-43-2	organic							0.226	0.0146	0.0033	HC1	0.03	HC1	1.90	16(1)
Benzo(a)pyrene	50-32-8	organic							2.3	0.137	0.03	HC1	0.13	HC1	5.5	16(1)
Benzo(b)fluoranthene	205-99-2	organic							0.23	0.0137	0.0031	HC2	0.13	HC1	6.25	16(1)
Benzo(g,h,i)perylene	191-24-2	organic							0.023	0.00137	0.00031	HC2	0.13	HC1	7.31	16(1)
Benzo(j)fluoranthene	205-82-3	organic							0.23	0.0137	0.0031	HC2	0.13	HC1	6.84	16(1)
Benzo(k)fluoranthene	207-08-9	organic							0.23	0.0137	0.0031	HC2	0.13	HC1	6.36	16(1)
Bis(2-ethyl-hexyl) phthalate	117-81-7	organic	0.044	0.044	0.044	0.044	0.044					HC1	0.1	HC1	4.82	16(1)
Bis(Chloro-methyl) ether	542-88-1	organic								41.3	9.43	HC1			1.20	16(1)
Boron (and borates)	7440-42-8	inorganic	0.0175	0.0175	0.0175	0.0175	0.0175					HC1	0.01	HC1	NA	
Bromoxynil	1689-84-5	organic	0.0005	0.0005	0.0005	0.0005	0.0005					HC1			2.72	16(1)
Cadmium	7440-43-9	inorganic	0.0008	0.0008	0.0008	0.0008	0.0008			42.9	9.8	HC1	0.01	HC1	NA	
Carbaryl	63-25-2	organic	0.01	0.01	0.01	0.01	0.01					HC1			2.36	1
Carbofuran	1563-66-2	organic	0.01	0.01	0.01	0.01	0.01					HC1			2.02	1
Carbon tetrachloride	56-23-5	organic							0.049			HC1	0.03	HC1	1.91	16(1)
Chloramine, mono	10599-90-3	organic	0.048	0.048	0.048	0.048	0.048					HC1			1.16	C9
Chlorobenzene	108-90-7	organic	0.43	0.43	0.43	0.43	0.43	0.01				HC1	0.03	HC1	2.31	16(1)
Chlorpyrifos	2921-88-2	organic	0.00075	0.00075	0.00075	0.001	0.001					HC1			3.78	1
Chromium, hexavalent	18540-29-9	inorganic								331	75.8	HC1	0.1	HC1	NA	
Chromium, total	7440-47-3	inorganic	0.001	0.001	0.001	0.001	0.001			47.6	10.9	HC1	0.1	HC1	NA	
Chrysene	218-01-9	organic							0.023	0.00137	0.00031	HC2	0.13	HC1	6.19	16(1)
Copper	7440-50-8	inorganic	0.091	0.091	0.111	0.126	0.141					HC1	0.06	HC1	NA	
Cumene (isopropylbenzene)	98-82-8	organic	0.1	0.1	0.1	0.1	0.1	0.4				IRIS			2.69	C2
Cyanazine	21725-46-2	organic	0.0013	0.0013	0.0013	0.0013	0.0013					HC1			2.30	1
Cyanide, free (CN- + HCN)	57-12-5	inorganic	0.02	0.02	0.02	0.02	0.02					HC1	0.1	HC1	1.23	C3
DDT (DDT, p,p'-)	50-29-3	organic	0.01	0.01	0.01	0.01	0.01					HC1	0.03	HC1	5.4	1
Diazinon	333-41-5	organic	0.0002	0.0002	0.0002	0.0002	0.0002					HC1			2.76	1
Dibenz(a,h)anthracene	53-70-3	organic							0.23	0.0137	0.0031	HC2	0.13	HC1	6.11	16(1)
Dibromoethane, 1,2-	106-93-4	organic	0.009	0.009	0.009	0.009	0.009	0.009				IRIS			1.64	16(1)
Dibutyl phthalate	84-74-2	organic	0.0625	0.0625	0.0625	0.0625	0.0625					HC1			3.01	16(1)
Dicamba	1918-00-9	organic	0.0125	0.0125	0.0125	0.0125	0.0125					HC1			0.18	16(1)
Dichlorobenzene, 1,2-	95-50-1	organic	0.43	0.43	0.43	0.43	0.43					HC1	0.03	HC1	2.70	16(1)
Dichlorobenzene, 1,4-	106-46-7	organic	0.11	0.11	0.11	0.11	0.11	0.095				HC1	0.03	HC1	2.72	16(1)
Dichlorobenzidine, 3,3'-	91-94-1	organic								0.0676		HC1	0.1	HC1	3.81	16(1)
Dichloroethane, 1,2-	107-06-2	organic								0.00806		HC1	0.03	HC1	1.40	16(1)
Dichloroethylene, 1,1	75-35-4	organic	0.003	0.003	0.003	0.003	0.003					HC1	0.03	HC1	2.00	16(1)
Dichloromethane	75-09-2	organic	0.05	0.05	0.05	0.05	0.05		0.000079	0.000099	0.000023	HC1	0.03	HC1	1.19	16(1)
Dichorophenol, 2,4-	120-83-2	organic	0.1	0.1	0.1	0.1	0.1					HC1	0.03	HC1	2.65	16(1)
Diclofop-methyl	51338-27-3	organic	0.001	0.001	0.001	0.001	0.001					HC1			4.20	1