

Table H3-1
Values Used for Daily Intake/Absorbed Dose
Inhalation of Particulates

Scenario Timeframe:	Future
Medium:	Particulates
Exposure Point	Breathing Zone
Receptor Population:	See Below
Receptor Age:	Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Equation/ Model Name
On-Site Worker	CS	Chemical Concentration in soil	mg/kg			$\frac{CS \times IR \times RAF \times EF \times ED \times ET \times (1/PEF)}{BW \times AT \times 365 \text{ days/yr}}$ INTAKE DOSE
	IR	Inhalation Rate	m3/hour	1.3	EPA, 1997	
	RAF	Relative Absorption Factor	unitless	1	EPA, 1991a	
	ET	Exposure Time	hours/day	8	EPA, 1991a	
	EF	Exposure Frequency	days/year	150	EPA, 1994	
	ED	Exposure Duration	years	25	EPA, 2001b	
	PEF	Particulate Emission Factor	m3/kg	1.36E+09	EPA, 2001b	
	BW	Body Weight	kg	70	EPA, 1991a	
	AT-C	Averaging Time, cancer	years	70	EPA, 1991a	
AT-N	Averaging Time, non-cancer	years	25	EPA, 2001b		
Construction Worker	Cssoil	Chemical Concentration in soil	mg/kg			$Q = CS_{soil} * E * CF$ $\frac{CS_{air} = CEF * A * 1000}{L * V * H}$ $\frac{CS_{air} \times IR \times RAF \times CF \times EF \times ED \times ET}{BW \times AT \times 365 \text{ days/yr}}$ INTAKE DOSE
	Csair	Chemical Concentration in air	mg/m3			
	IR	Inhalation Rate	m3/hour	1.3	EPA, 1997	
	RAF	Relative Absorption Factor	unitless	1	EPA, 1991a	
	ET	Exposure Time	hours/day	8	EPA, 1991a	
	EF	Exposure Frequency	days/year	173	BPJ	
	ED	Exposure Duration	years	1	EPA, 2001b	
	BW	Body Weight	kg	70	EPA, 1991a	
	AT-C	Averaging Time, cancer	years	70	EPA, 1991a	
	AT-N	Averaging Time, non-cancer	years	1	EPA, 2001b	
	Q	Contaminant Emission Flux	g/m2-sec	chem specific		
	E	Construction Emission Factor	g/m2-sec	1.04E-04	EPA, 1993	
	A	Source Areas Surface Area	m2	10,120	BPJ	
	L	Width of Source Area	m	100	BPJ	
	V	Average Windspeed	m/sec	2.25	BPJ	
	H	Box Height	m	2	BPJ	
CF	Conversion Factor	kg/mg	10 ⁻⁶			

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Inhalation of Particulates

Scenario Timeframe:	Future
Medium:	Particulates
Exposure Point	Breathing Zone
Receptor Population:	See Below
Receptor Age:	Adult

Resident	CS	Chemical Concentration in soil	mg/kg			
	IR	Inhalation Rate	m3/day	13	EPA, 2001b	$\frac{CS \times IR \times RAF \times EF \times ED \times ET \times (1/PEF)}{BW \times AT \times 365 \text{ days/yr}}$
	IRchild ¹	Inhalation Rate (child)	m3/day	8.1	EPA, 2001b	
	RAF	Relative Absorption Factor	unitless	1	EPA, 1991a	
	ET	Exposure Time	24 hours/24- hour	1	EPA, 1991a	
	EF	Exposure Frequency	days/year	150	EPA, 1994	
	ED	Exposure Duration	years	30	EPA, 2001b	
	EDchild ¹	Exposure Duration (child)	years	6	EPA, 2001b	
	PEF	Particulate Emission Factor	m3/kg	1.36E+09	EPA, 2001b	
	BW	Body Weight	kg	70	EPA, 1991a	
	BWchild ¹	Body Weight (child)	kg	15	EPA, 2001b	
	AT-C	Averaging Time, cancer	years	70	EPA, 1991a	
	AT-N	Averaging Time, non-cancer	years	30	EPA, 2001b	

(1) - These exposure factors are used to evaluate noncarcinogenic risks based on childhood exposure.

BPJ - Best Professional Judgement

- Definitions:
- mg - milligram
 - kg - kilogram
 - RME - Reasonable Maximum Exposure
 - CEF - Surface emission flux parameter

Table H3-2
Exposure Point Concentrations and Toxicity Information for the Soil COPCs

Chemical of Potential Concern	Maximum Soil Concentration Bailey Point (mg/kg)	Residential Inhalation PRGs ¹ (mg/kg)	Industrial Inhalation PRGs ¹ (mg/kg)	Unit Risk Factor (ug/m3)-1	Inhalation Slope Factor 1/(mg/kg-d)	Chronic Reference Concentration (mg/m3)	Chronic Inhalation RfD (mg/kg-day)	Subchronic Reference Concentration (mg/m3)
				ref	ref	ref	ref	ref
ALUMINUM	30700	3000000	9400000				1.00E-03 N	
ANTIMONY	2.2	31	410					4.00E-04 U
ARSENIC	22	590	1300	4.30E-03 I				
BARIUM	169	290000	960000			5.00E-04 H	1.40E-04 H	
BERYLLIUM	2.1	1100	2200	2.40E-03 I		2.00E-05 I	5.70E-06 I	
BORON	23	12000000	38000000					9.00E-02 H
CADMIUM	1.6	1400	3000	1.80E-03 I				
CHROMIUM	162							
COBALT	18	900	1900	2.80E-03 N		2.00E-05 N		
COPPER	757							
IRON	46600							
LEAD	969							
MAGNESIUM	14100							
MANGANESE	1300	29000	94000			5.00E-05 I		
MERCURY CHLORIDE	0.51					3.00E-04 I		
MOLYBDENUM	11.2							
NICKEL	153							
POTASSIUM	11100							
SELENIUM	1.3							
SILVER	7.4					1.00E-05 U		1.00E-04 U
SODIUM	3700							
THALLIUM	1.5							
VANADIUM	62.7							
ZINC	1060							
PCB-1242	0.098	4400	9400		2.00E+00 E			
PCB-1248	0.064	4400	9400		2.00E+00 E			
PCB-1254	1.400	4400	9400		2.00E+00 E			
PCB-1260	0.60	4400	9400		2.00E+00 E			
4,4'-DDT	0.007	26000	55000	9.70E-05 I				
ALDRIN	0.004	520	1100	4.90E-03 I				
DIELDRIN	0.013	550	1200	4.60E-03 I				
ENDRIN	0.0096	620000	2000000					
ENDRIN ALDEHYDE	0.0024							
GAMMA BHC	0.0040	6800	14000					
HEPTACHLOR EPOXIDE	0.00087	970	2100	2.60E-03 I				
METHOXYCHLOR	0.0098	10000000	34000000					
2-METHYLNAPHTHALENE	2.80							
4-METHYLPHENOL	0.47	10000000	34000000					
ACENAPHTHYLENE	3.40							
ANTHRACENE	9.00	330000	1100000					
BENZO(A)ANTHRACENE	19	12000	26000	8.80E-04 U				
BENZO(A)PYRENE	16	1200	2600	8.80E-04 U				
BENZO(B)FLUORANTHENE	21	12000	26000	8.80E-04 U				
BENZO(K)FLUORANTHENE	8.4	120000	260000	8.80E-04 U				

Table H3-2
Exposure Point Concentrations and Toxicity Information for the Soil COPCs

Chemical of Potential Concern	Maximum Soil Concentration Bailey Point (mg/kg)	Residential Inhalation PRGs ¹ (mg/kg)	Industrial Inhalation PRGs ¹ (mg/kg)	Unit Risk Factor (ug/m3)-1 ref	Inhalation Slope Factor 1/(mg/kg-d) ref	Chronic Reference Concentration (mg/m3) ref	Chronic Inhalation RfD (mg/kg-day) ref	Subchronic Reference Concentration (mg/m3) ref
BENZO[G,H,I]PERYLENE	8.4							
BIS(2-ETHYLHEXYL) PHTHALATE	2.3	630000	1300000		1.40E-02 N			1.00E-02 U
BUTYL BENZYL PHTHALATE	2.6	410000000	1300000000					
CARBAZOLE	8.1							
CHRYSENE	20	1200000	2600000	8.80E-04 U				
DI-N-BUTYL PHTHALATE	0.51	210000000	670000000					
DIBENZO(A,H)ANTHRACENE	1.75	1200	2600	8.80E-04 U				
DIBENZOFURAN	2.45	4100	13000					
FLUORANTHENE	49	82000000	270000000					
FLUORENE	4.60	23000	74000					
INDENO(1,2,3-CD)PYRENE	9.7	12000	26000	8.80E-04 U				
NAPHTHALENE	1.25	58	190			3.00E-03 I		
PHENANTHRENE	36							
PYRENE	40	180000	580000					
1,1,1-TRICHLOROETHANE	0.006	2700	7100					
2-BUTANONE (MEK)	0.16							
2-HEXANONE	0.041	900	2900			5.00E-03 U		5.00E-02 U
4-METHYL-2-PENTANONE (MIBK)	2.90	8700	28000			3.00E+00 I		8.00E-01 H
ACETONE	0.63	2000	6400					1.30E+01 M
BENZENE	0.016	1	1	7.80E-06 I		3.00E-02 I		4.00E-03 M
CARBON DISULFIDE	0.004	370	1200			7.00E-01 I		7.00E-01 H
CHLOROFORM	0.003	4	12	2.30E-05 I		5.00E-02 U	8.60E-04 N	5.00E-02 U
ETHYLBENZENE	61					1.00E+00 I		1.00E+00 M
M-,P-XYLENE	200	280	900			1.00E-01 I		7.00E-01 M
METHYLENE CHLORIDE	0.09	10	22	4.70E-07 I				3.00E-01 M
O-XYLENE	79	280	900			1.00E-01 I		7.00E-01 M
TOLUENE	0.49	680	2200			4.00E-01 I		
TRICHLOROETHENE	0.06	0.055	0.12		4.00E-01 N	4.00E-02 N		1.00E-01 M
VINYL CHLORIDE	0.03	0.11	0.93	4.40E-06 I	3.10E-02 I	1.00E-01 I		3.00E-02 M

ref - I - IRIS; N - NCEA; H - HEAST as referenced in USEPA Region 9 PRG Tables (October, 2002); E - EPA Region I Risk Update #2 and
 USEPA Guidance on PCBs (EPA/600/P-96/001F); U - USEPA in letter dated June 2, 2003 (USEPA, 2003); CA - California Office of Health Hazard Assessment (2003)
 M - ATSDR Minimal Risk Levels (ATSDR, 2003); U* - modified subchronic RfC based on chronic study provided by USEPA (USEPA, 2003)

1 - USEPA Region 9, October, 2002

IRIS - Integrated Risk Information System

mg/kg-day = milligram/kilogram - day

NCEA - National Center for Environmental Assessment

HEAST - Health Effects Assessment Summary Table

The Reference Concentration (RfC) can be converted to an inhalation RfD as follows: RfC (mg/m3) * 20 m3/day * 1/70 kg = inhalation RfD (mg/kg-day)

The Unit Risk Factor (URF) can be converted to an Inhalation Cancer Slope Factor as follows: URF 1/(ug/m3) * 1/20 m3/day * 70 * 10E-3 ug/1 mg = Inhalation CSF (mg/kg-day)-1

**Table H3-3
Non Carcinogenic Risks - Inhalation Exposure - Residential Scenario**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	Resident

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG (Residential) (mg/kg)	Chronic Reference Concentration (mg/m3)	Inhalation Intake ⁽¹⁾ mg/kg-day	Inhalation Reference Dose (mg/kg-day)	Non Cancer Hazard Index
Inhalation	Aluminum	30700	2900000	4.00E-03	1.72E-06	1.0E-03	1.72E-03
	Barium	169	290000	5.00E-04	9.48E-09	1.4E-04	6.64E-05
	Beryllium	2.1	1100	2.00E-05	1.18E-10	5.7E-06	2.06E-05
	Cobalt	18.35	900	2.00E-05	1.03E-09	5.7E-06	1.80E-04
	Manganese	1300	29000	5.00E-05	7.30E-08	1.4E-05	5.11E-03
	Mercury	0.51		3.00E-04	2.86E-11	8.6E-05	3.34E-07
	Silver	7.4		1.00E-05	4.15E-10	2.9E-06	1.45E-04
	Naphthalene	1.25	58	3.00E-03	7.01E-11	8.6E-04	8.18E-08
	2-Hexanone	0.041	8700	5.00E-03	2.30E-12	1.4E-03	1.61E-09
	4-Methyl-2-Pentanone	2.9	900	3.00E+00	1.63E-10	8.6E-01	1.90E-10
	Benzene	0.016	0.60	3.00E-02	8.98E-13	8.6E-03	1.05E-10
	Carbon Disulfide	0.004	370	7.00E-01	2.24E-13	2.0E-01	1.12E-12
	Chloroform	0.003	3.60	5.00E-02	1.68E-13	1.4E-02	1.18E-11
	Ethylbenzene	61	2400	1.00E+00	3.42E-09	2.9E-01	1.20E-08
	M-P-Xylene	200	280	1.00E-01	1.12E-08	2.9E-02	3.93E-07
	O-Xylene	79	280	1.00E-01	4.43E-09	2.9E-02	1.55E-07
	Toluene	0.49	680	4.00E-01	2.75E-11	1.1E-01	2.41E-10
Trichloroethene	0.058	0.06	4.00E-02	3.25E-12	1.1E-02	2.85E-10	
Vinyl Chloride	0.029	0.11	1.00E-01	1.63E-12	2.9E-02	5.70E-11	
Total Non Cancer Risk Across All Exposure Routes/Pathways							7.2E-03

(1) Intake Inhalation = $EPC * (IR * ED * EF * (1/PEF)) / (AT * BW)$

= $EPC * 5.61E-11$

PRG - Preliminary Remediation Goal	EPC, mg/kg	Exposure Point Concentration	chem-specific
mg/kg = milligram/kilogram	IR m3/day	Inhalation Rate	13
mg/kg - day = milligram/kilogram - day	EF, day/yr	Exposure Frequency	150
NA = Not Applicable	AT, days	Averaging Time	10950
EPC = Exposure Point Concentration	PEF, m3/kg	Particulate Emission Factor	1.36E+09
	ED, years	Exposure duration	30
	BW, kg	Body Weight	70

Table H3-4

Non Carcinogenic Risks - Inhalation Exposure - On-Site Worker Scenario

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	On-Site Worker

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG (Residential) (mg/kg)	Chronic Reference Concentration (mg/m3)	Inhalation Intake (1) mg/kg-day	Inhalation Reference Dose (mg/kg-day)	Non Cancer Hazard Index
Inhalation	Aluminum	30700	9400000	4.00E-03	1.38E-06	1.1E-03	1.21E-03
	Barium	169	960000	5.00E-04	7.59E-09	1.4E-04	5.31E-05
	Beryllium	2.1	2200	2.00E-05	9.43E-11	5.7E-06	1.65E-05
	Cobalt	18.35	1900	2.00E-05	8.24E-10	5.7E-06	1.44E-04
	Mangansese	1300	94000	5.00E-05	5.84E-08	1.4E-05	4.09E-03
	Mercury	0.51		3.00E-04	2.29E-11	8.6E-05	2.67E-07
	Silver	7.4		1.00E-05	3.32E-10	2.9E-06	1.16E-04
	Naphthalene	1.25	190.000	3.00E-03	5.61E-11	8.6E-04	6.55E-08
	2-Hexanone	0.041	28000	5.00E-03	1.84E-12	1.4E-03	1.29E-09
	4-Methyl-2-Pentanone	2.9	2900	3.00E+00	1.30E-10	8.6E-01	1.52E-10
	Benzene	0.016	1.3	3.00E-02	7.18E-13	8.6E-03	8.38E-11
	Carbon Disulfide	0.004	1200	7.00E-01	1.80E-13	2.0E-01	8.98E-13
	Chloroform	0.003	12.000	5.00E-02	1.35E-13	1.4E-02	9.43E-12
	Ethylbenzene	61	8000	1.00E+00	2.74E-09	2.9E-01	9.59E-09
	M-P-Xylene	200	900	1.00E-01	8.98E-09	2.9E-02	3.14E-07
	O-Xylene	79	900	1.00E-01	3.55E-09	2.9E-02	1.24E-07
	Toluene	0.49	2200	4.00E-01	2.20E-11	1.1E-01	1.92E-10
	Trichloroethene	0.058	0.12	4.00E-02	2.60E-12	1.1E-02	2.28E-10
Vinyl Chloride	0.029	0.93	1.00E-01	1.30E-12	2.9E-02	4.56E-11	
Total Non Cancer Risk Across All Exposure Routes/Pathways							5.6E-03

(1) Intake Inhalation = $EPC * (IR * ED * ET * EF * (1/PEF)) / (AT * BW)$
 = EPC * 4.49E-11

	EPC, mg/kg	Exposure Point Concentration	chem-specific
mg/kg = milligram/kilogram	IR m3/hour	Inhalation Rate	1.3
mg/kg - day = milligram/kilogram - day	EF, day/yr	Exposure Frequency	150
EPC = Exposure Point Concentration	AT, days	Averaging Time	9125
PRG - Preliminary Remediation Goal	PEF, m3/kg	Particulate Emission Factor	1.36E+09
	ED, years	Exposure duration	25
	BW, kg	Body Weight	70
	ET, hours/day	Exposure Time	8.0

**Table H3-5
Non Carcinogenic Risks - Inhalation Exposure - Child**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	Child Resident

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG (Residential) (mg/kg)	Chronic Reference Concentration (mg/m3)	Inhalation Intake (1) mg/kg-day	Inhalation Reference Dose (mg/kg-day)	Non Cancer Hazard Index	
Inhalation	Aluminum	30700	2900000	4.00E-03	5.01E-06	1.1E-03	4.38E-03	
	Barium	169	290000	5.00E-04	2.76E-08	1.4E-04	1.93E-04	
	Beryllium	2.1	1100	2.00E-05	3.43E-10	5.7E-06	6.00E-05	
	Cobalt	18.35	900	2.00E-05	2.99E-09	5.7E-06	5.24E-04	
	Mangansese	1300	29000	5.00E-05	2.12E-07	1.4E-05	1.48E-02	
	Mercury	0.51		3.00E-04	8.32E-11	8.6E-05	9.71E-07	
	Silver	7.4		1.00E-05	1.21E-09	2.9E-06	4.23E-04	
	Naphthalene	1.25	58	3.00E-03	2.04E-10	8.6E-04	2.38E-07	
	2-Hexanone	0.041	8700	5.00E-03	6.69E-12	1.4E-03	4.68E-09	
	4-Methyl-2-Pentanone	2.9	900	3.00E+00	4.73E-10	8.6E-01	5.52E-10	
	Benzene	0.016	0.60	3.00E-02	2.61E-12	8.6E-03	3.05E-10	
	Carbon Disulfide	0.004	370	7.00E-01	6.53E-13	2.0E-01	3.26E-12	
	Chloroform	0.003	3.60	5.00E-02	4.90E-13	1.4E-02	3.43E-11	
	Ethylbenzene	61	2400	1.00E+00	9.95E-09	2.9E-01	3.48E-08	
	M-P-Xylene	200	280	1.00E-01	3.26E-08	2.9E-02	1.14E-06	
	O-Xylene	79	280	1.00E-01	1.29E-08	2.9E-02	4.51E-07	
	Toluene	0.49	680	4.00E-01	8.00E-11	1.1E-01	7.00E-10	
Trichloroethene	0.058	0.06	4.00E-02	9.46E-12	1.1E-02	8.28E-10		
Vinyl Chloride	0.029	0.11	1.00E-01	4.73E-12	2.9E-02	1.66E-10		
* = obtained from USEPA, 2001, specific to fugitive dust							Total Non Cancer Risk Across All Exposure Routes/Pathways	2.0E-02

(1) Intake Inhalation = EPC * (IR*ED*EF*(1/PEF))/(AT*BW)

= EPC* 1.63E-10

EPC, mg/kg	Exposure Point Concentration	chem-specific
IR m3/day	Inhalation Rate	8.1
EF, day/yr	Exposure Frequency	150
AT, days (ED*365)	Averaging Time	2190
PEF, m3/kg	Particulate Emission Factor	1.36E+09
ED, years	Exposure duration	6
BW, kg	Body Weight	15
mg/kg = milligram/kilogram		
mg/kg - day = milligram/kilogram - day		
PRG - Preliminary Remediation Goal		
EPC = Exposure Point Concentration		

**Table H3-7
Carcinogenic Risks - Inhalation Exposure - Residential Scenario**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	Resident

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG ¹ (Residential) (mg/kg)	Unit Risk Factor ² (ug/m3)-1	Chemical Intake mg/kg-day	Cancer Slope Factor 1/(mg/kg-day)	Cancer Risks
Inhalation	4,4-DDT	0.007	26000	9.70E-05	1.73E-13	3.4E-01	5.88E-14
	Aldrin	0.004	520	4.90E-03	9.86E-14	1.7E+01	1.69E-12
	Arsenic	22.3	770*	4.30E-03	5.36E-10	1.5E+01	8.07E-09
	Benzene	0.016	0.630	7.80E-06	3.85E-13	2.7E-02	1.05E-14
	Beryllium	2.100	1400*	2.40E-03	5.05E-11	8.4E+00	4.24E-10
	DEHP	2.300	630000		5.53E-11	1.4E-02	7.74E-13
	Dieldrin	0.013	550	4.60E-03	3.13E-13	1.6E+01	5.03E-12
	Gamma BHC	0.004	6800		9.38E-14		
	Heptachlor Epoxide	0.00087	970	2.60E-03	2.09E-14	9.1E+00	1.90E-13
	Methylene Chloride	0.090	10	4.70E-07	2.16E-12	1.6E-03	3.56E-15
	Trichloroethene	0.058	NA		1.39E-12	4.0E-01	5.58E-13
	Vinyl chloride	0.029	0.110	4.40E-06	6.97E-13	1.5E-02	1.07E-14
	Chloroform	0.003	3.600	2.30E-05	7.22E-14	8.1E-02	5.81E-15
	Cadmium	1.600	1400	1.80E-03	3.85E-11	6.3E+00	2.42E-10
	Cobalt	18.350	900	2.80E-03	4.41E-10	9.8E+00	4.33E-09
	PCB-1242	0.098	4400		2.36E-12	2.0E+00	4.71E-12
	PCB-1248	0.064	4400		1.54E-12	2.0E+00	3.08E-12
	PCB-1254	1.400	4400		3.37E-11	2.0E+00	6.73E-11
	PCB-1260	0.600	4400		1.44E-11	2.00E+00	2.89E-11
	Benzo(a)pyrene	16	1200	8.80E-04	3.85E-10	3.1E+00	1.19E-09
	Benzo(a)anthracene	19	12000	8.80E-04	4.57E-10	3.1E+00	1.41E-09
	Benzo(b)fluoranthene	21	12000	8.80E-04	5.05E-10	3.1E+00	1.56E-09
	Benzo(k)fluoranthene	8.4	120000	8.80E-04	2.02E-10	3.1E+00	6.22E-10
	Chrysene	19	1200000	8.80E-04	4.57E-10	3.1E+00	1.41E-09
Indeno(1,2,3-cd)pyrene	9.7	12000	8.80E-04	2.33E-10	3.1E+00	7.19E-10	
Dibenz(a,h)anthracene	1.77	1200	8.80E-04	4.26E-11	3.1E+00	1.31E-10	
Total Cancer Risk Across All Exposure Routes/Pathways							2.0E-08

(1) - USEPA Region 9 PRGs specific to the inhalation route of exposure

Total Cancer Risk Across All Exposure Routes/Pathways

2.0E-08

(2) - Unit risk factors are converted to Cancer Slope Factor as follows: (URF(ug/m3)-1 * 70kg * 1000ug/mg)/20day/m3

Intake Inhalation = EPC * (IR*ED*EF*(1/PEF))/(AT*BW)
= EPC * 2.41E-11

mg/kg = milligram/kilogram	EPC, mg/kg	Exposure Point Concentration	chem-specific
mg/kg - day = milligram/kilogram - day	IR (m3/day)	Inhalation Rate	13
PRG - Preliminary Remediation Goal	EF, day/yr	Exposure Frequency	150
EPC = Exposure Point Concentration	AT, days	Averaging Time	25550
	PEF, m3/kg	Particulate Emission Factor	1.36E+09
	ED, years	Exposure duration	30
	BW, kg	Body Weight	70

**Table H3-8
Carcinogenic Risks - Inhalation Exposure - On-Site Worker**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	On-Site Worker

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG ¹ (Industrial) (mg/kg)	Unit Risk Factor ² (ug/m3)-1	Chemical Intake (mg/kg-day)	Cancer Slope Factor 1/(mg/kg-day)	Cancer Risks
Inhalation	4,4-DDT	0.007	55000	9.70E-05	1.15E-13	3.4E-01	3.93E-14
	Aldrin	0.004	1100	4.90E-03	6.41E-14	1.7E+01	1.09E-12
	Arsenic	23.1	1400	4.30E-03	3.70E-10	1.5E+01	5.56E-09
	Benzene	0.016	1.3	7.80E-06	2.57E-13	2.7E-02	6.93E-15
	Beryllium	2.100	2600	2.40E-03	3.37E-11	8.4E+00	2.83E-10
	DEHP	2.300	1300000		3.69E-11	1.4E-02	5.16E-13
	Dieldrin	0.013	1200	4.60E-03	2.08E-13	1.6E+01	3.34E-12
	Gamma BHC	0.004	14000		6.25E-14		
	Heptachlor Epoxide	0.00087	2100	2.60E-03	1.40E-14	9.1E+00	1.28E-13
	Methylene Chloride	0.090	22	4.70E-07	1.44E-12	1.6E-03	2.31E-15
	Trichloroethene	0.058	0.12		9.30E-13	4.0E-01	3.72E-13
	Vinyl chloride	0.029	0.93	4.40E-06	4.65E-13	1.5E-02	6.97E-15
	Chloroform	0.003	12	2.30E-05	4.81E-14	8.1E-02	3.87E-15
	Cadmium	1.600	900	1.80E-03	2.57E-11	6.3E+00	1.62E-10
	Cobalt	18.350	1900	2.80E-03	2.94E-10	9.8E+00	2.88E-09
	PCB-1242	0.098	9400		1.57E-12	2.0E+00	3.14E-12
	PCB-1248	0.064	9400		1.03E-12	2.0E+00	2.05E-12
	PCB-1254	1.400	9400		2.24E-11	2.0E+00	4.49E-11
	PCB-1260	0.600	9400		9.62E-12	2.0E+00	1.92E-11
	Benzo(a)pyrene	16	2600	8.80E-04	2.57E-10	3.1E+00	7.90E-10
	Benzo(a)anthracene	19	26000	8.80E-04	3.05E-10	3.1E+00	9.38E-10
	Benzo(b)fluoranthene	21	26000	8.80E-04	3.37E-10	3.1E+00	1.04E-09
	Benzo(k)fluoranthene	8.4	260000	8.80E-04	1.35E-10	3.1E+00	4.15E-10
Chrysene	19	2600000	8.80E-04	3.05E-10	3.1E+00	9.38E-10	
Indeno(1,2,3-cd)pyrene	9.7	26000	8.80E-04	1.56E-10	3.1E+00	4.79E-10	
Dibenz(a,h)anthracene	1.7	2600	8.80E-04	2.73E-11	3.1E+00	8.40E-11	
Total Cancer Risk Across All Exposure Routes/Pathways							1.4E-08

(1) - USEPA Region 9 PRGs specific to the inhalation route of exposure

(2) - Unit risk factors are converted to Cancer Slope Factor as follows: (URF(ug/m3)-1 * 70kg * 1000ug/mg)/20day/m3

Intake Inhalation = EPC*(IR*ET*EF*ED*(1/PEF))/(AT*BW)
= EPC * 1.60E-11

mg/kg = milligram/kilogram	EPC, mg/kg	Exposure Point Concentration	chem-specific
mg/kg - day = milligram/kilogram - day	IR, m3/hour	Inhalation Rate	1.3
EPC = Exposure Point Concentration	ET, hours/day	Exposure Time	8
PRG - Preliminary Remediation Goal	EF, day/yr	Exposure Frequency	150
	AT, day	Averaging Time	25550
	ED, years	Exposure duration	25
	BW, kg	Body Weight	70
	PEF, m3/kg	Particulate Emission Factor	1.36E+09

**Table H3-9
Carcinogenic Risks - Inhalation Exposure - Construction Worker**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	Construction Worker

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Inhalation PRG ¹ (Industrial) (mg/kg)	Unit Risk Factor ² (ug/m3)-1	Contaminant Emission Flux ³ (g/m2-s)	EPC in Air ⁴ (mg/m3)	Chemical Intake (mg/kg-day)	Cancer Slope Factor 1/(mg/kg-day)	Cancer Risks	
Inhalation	4,4-DDT	0.007	NA	9.70E-05	7.49E-13	1.68E-08	1.69E-11	3.40E-01	5.75E-12	
	Aldrin	0.004	NA	4.90E-03	4.16E-13	9.36E-09	9.41E-12	1.72E+01	1.61E-10	
	Arsenic	22.3	NA	4.30E-03	2.32E-09	5.22E-05	5.25E-08	1.51E+01	7.90E-07	
	Benzene	0.016	NA	7.80E-06	1.66E-12	3.74E-08	3.76E-11	2.73E-02	1.03E-12	
	Beryllium	2.100	NA	2.40E-03	2.18E-10	4.91E-06	4.94E-09	8.40E+00	4.15E-08	
	DEHP	2.300	NA		2.39E-10	5.38E-06	5.41E-09	1.40E-02	7.58E-11	
	Dieldrin	0.013	NA	4.60E-03	1.35E-12	3.04E-08	3.06E-11	1.61E+01	4.92E-10	
	Gamma BHC	0.004	NA		4.06E-13	9.12E-09	9.18E-12			
	Heptachlor Epoxide	0.00087	NA	2.60E-03	9.09E-14	2.04E-09	2.06E-12	9.10E+00	1.87E-11	
	Methylene Chloride	0.090	NA	4.70E-07	9.36E-12	2.10E-07	2.12E-10	1.65E-03	3.48E-13	
	Trichloroethene	0.058	NA		6.03E-12	1.36E-07	1.36E-10	4.00E-01	5.46E-11	
	Vinyl chloride	0.029	NA	4.40E-06	3.02E-12	6.78E-08	6.82E-11	1.54E-02	1.05E-12	
	Chloroform	0.003	NA	2.30E-05	3.12E-13	7.02E-09	7.06E-12	8.05E-02	5.68E-13	
	Cadmium	1.600	NA	1.80E-03	1.66E-10	3.74E-06	3.76E-09	6.30E+00	2.37E-08	
	Cobalt	18.350	NA	2.80E-03	1.91E-09	4.29E-05	4.32E-08	9.80E+00	4.23E-07	
	PCB-1242	0.098	NA		1.02E-11	2.29E-07	2.31E-10	2.00E+00	4.61E-10	
	PCB-1248	0.064	NA		6.66E-12	1.50E-07	1.51E-10	2.00E+00	3.01E-10	
	PCB-1254	1.400	NA		1.46E-10	3.27E-06	3.29E-09	2.00E+00	6.59E-09	
	PCB-1260	0.600	NA		6.24E-11	1.40E-06	1.41E-09	2.00E+00	2.82E-09	
	Benzo(a)pyrene	16	NA	8.80E-04	1.66E-09	3.74E-05	3.76E-08	3.08E+00	1.16E-07	
	Benzo(a)anthracene	19	NA	8.80E-04	1.98E-09	4.44E-05	4.47E-08	3.08E+00	1.38E-07	
	Benzo(b)fluoranthene	21	NA	8.80E-04	2.18E-09	4.91E-05	4.94E-08	3.08E+00	1.52E-07	
	Benzo(k)fluoranthene	8.4	NA	8.80E-04	8.74E-10	1.96E-05	1.98E-08	3.08E+00	6.09E-08	
	Chrysene	19	NA	8.80E-04	1.98E-09	4.44E-05	4.47E-08	3.08E+00	1.38E-07	
	Indeno(1,2,3-cd)pyrene	9.7	NA	8.80E-04	1.01E-09	2.27E-05	2.28E-08	3.08E+00	7.03E-08	
	Dibenz(a,h)anthracene	1.75	NA	8.80E-04	1.82E-10	4.09E-06	4.12E-09	3.08E+00	1.27E-08	
	Total Cancer Risk Across All Exposure Routes/Pathways									2.0E-06

(1) -USEPA Region 9 PRGs specific to inhalation route of exposure - Not applicable to this scenario

(2) - Unit risk factors are converted to Cancer Slope Factor as follows: (URF(ug/m3)-1 * 70kg * 1000ug/mg)/20day/m3

$$\text{Intake Inhalation} = \frac{\text{EPCair} * (\text{IR} * \text{ET} * \text{EF} * \text{ED}) / (\text{AT} * \text{BW})}{\text{EPCair} * 1.01E-03}$$

mg/kg = milligram/kilogram

mg/kg - day = milligram/kilogram - day

EPC = Exposure Point Concentration

PRG - Preliminary Remediation Goal

NA - Not Applicable

Csair, mg/m3

CSsoil, mg/kg

IR, m3/day

ET, hours/hours

EF, day/yr

AT, days

ED, years

BW, kg

Exposure Point Concentration -air

Exposure Point Concentration soil

Inhalation Rate

Exposure Time

Exposure Frequency

Averaging Time

Exposure duration

Body Weight

1.3

8.00

173

25550

1

70

chem-specific

chem-specific

(3) - Contaminant Emission Flux (Q) = CSsoil * E (1E-4) * CF (1E-6)

(4) - Concentration in air = (Q * A * 1000mg/g)/(L * V * H)

A, m2

L, m

V, m/s

H, m

E, g/m2-sec

CF mg/kg

source area surface area

width of source area

average windspeed

Box Height

Heavy Construction Emission Factor

Conversion Factor

10,120

100

2.25

2

1.04E-04

1.00E-06

2.5-acre

square area

USEPA default

USEPA default

Table H3-10
Non Carcinogenic Risks - Predicted Fugitive Dust Concentrations

Scenario Timeframe:	Future
Medium:	Particulates
Exposure Point:	Breathing Zone
Exposure Medium:	Airborne Particulates
Receptor Population:	Resident

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Airborne Dust Concentration [EPC/PEF (mg/m3)]	Chronic Reference Concentration (mg/m3)	Hazard Index
Inhalation	Aluminum	30700	2.26E-05	4.00E-03	5.64E-03
	Barium	169	1.24E-07	5.00E-04	2.49E-04
	Beryllium	2.1	1.54E-09	2.00E-05	7.72E-05
	Cobalt	18.35	1.35E-08	2.00E-05	6.75E-04
	Mangansese	1300	9.56E-07	5.00E-05	1.91E-02
	Mercury	0.51	3.75E-10	3.00E-04	1.25E-06
	Silver	7.4	5.44E-09	1.00E-05	5.44E-04
	Naphthalene	1.25	9.19E-10	3.00E-03	3.06E-07
	2-Hexanone	0.041	3.01E-11	5.00E-03	6.03E-09
	4-Methyl-2-Pentanone	2.9	2.13E-09	3.00E+00	7.11E-10
	Benzene	0.016	1.18E-11	3.00E-02	3.92E-10
	Carbon Disulfide	0.004	2.94E-12	7.00E-01	4.20E-12
	Chloroform	0.003	2.21E-12	5.00E-02	4.41E-11
	Ethylbenzene	61	4.49E-08	1.00E+00	4.49E-08
	M-P-Xylene	200	1.47E-07	1.00E-01	1.47E-06
	O-Xylene	79	5.81E-08	1.00E-01	5.81E-07
	Toluene	0.49	3.60E-10	4.00E-01	9.01E-10
	Trichloroethene	0.058	4.26E-11	4.00E-02	1.07E-09
Vinyl Chloride	0.029	2.13E-11	1.00E-01	2.13E-10	
					2.6E-02

mg/kg = milligram/kilogram
mg/kg - day = milligram/kilogram - day
EPC = Exposure Point Concentration
PEF - Particulate Emission Factor

**Table H3-11
Carcinogenic Risks - Predicted Fugitive Dust Concentrations**

Scenario Timeframe:	Future
Medium:	All Soils
Exposure Medium:	Airborne Particulates
Exposure Point:	Breathing Zone
Receptor Population:	Resident

Exposure Route	Chemical of Potential Concern	EPC (mg/kg)	Airborne Dust Concentration [EPC/PEF (ug/m3)]	Unit Risk Factor ² (ug/m3)-1	Cancer Risk	
Inhalation	4,4-DDT	0.007	5.29E-09	9.70E-05	5.14E-13	
	Aldrin	0.004	3.01E-09	4.90E-03	1.48E-11	
	Arsenic	22.3	1.64E-05	4.30E-03	7.05E-08	
	Benzene	0.016	1.18E-08	7.80E-06	9.18E-14	
	Beryllium	2.100	1.54E-06	2.40E-03	3.71E-09	
	DEHP	2.300	1.69E-06			
	Dieldrin	0.013	9.56E-09	4.60E-03	4.40E-11	
	Gamma BHC	0.004	2.87E-09			
	Heptachlor Epoxide	0.00087	6.40E-10	2.60E-03	1.66E-12	
	Methylene Chloride	0.090	6.62E-08	4.70E-07	3.11E-14	
	Trichloroethene	0.058	4.26E-08			
	Vinyl chloride	0.029	2.13E-08	4.40E-06	9.38E-14	
	Chloroform	0.003	2.21E-09	2.30E-05	5.07E-14	
	Cadmium	1.600	1.18E-06	1.80E-03	2.12E-09	
	Cobalt	18.350	1.35E-05	2.80E-03	3.78E-08	
	PCB-1242	0.098	7.21E-08			
	PCB-1248	0.064	4.71E-08			
	PCB-1254	1.400	1.03E-06			
	PCB-1260	0.600	4.41E-07			
	Benzo(a)pyrene	16	1.18E-05	8.80E-04	1.04E-08	
	Benzo(a)anthracene	19	1.40E-05	8.80E-04	1.23E-08	
	Benzo(b)fluoranthene	21	1.54E-05	8.80E-04	1.36E-08	
	Benzo(k)fluoranthene	8.4	6.18E-06	8.80E-04	5.44E-09	
	Chrysene	19	1.40E-05	8.80E-04	1.23E-08	
	Indeno(1,2,3-cd)pyrene	9.7	7.13E-06	8.80E-04	6.28E-09	
	Dibenz(a,h)anthracene	1.77	1.30E-06	8.80E-04	1.15E-09	
						1.8E-07

mg/kg = milligram/kilogram
mg/kg - day = milligram/kilogram - day
EPC = Exposure Point Concentration
PEF - Particulate Emission Factor