Overview of Appendix 1

- Table A - Default Closure Tables for Residential and Industrial Land Use Applications
- Table B - Chemical/Physical Properties
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A1.0 Introduction

This appendix provides various tables of values needed to determine default closure levels under RISC. A short narrative describing each table is provided below; the tables are provided following the text.

Table A

Table A is divided into two main sections, Residential and Commercial/ Industrial. Each of these is further divided into two subsections, Soil and Ground Water. Each section presents applicable closure levels and footnotes.

Both the Industrial and Residential Soil Closure Level sections provide concentrations for soil saturation (Csat); soil attenuation capacity (SAC); and construction worker, direct, and migration to ground water pathways. A final column presents the Default Closure Level, as determined by the lowest of Csat; SAC; and construction worker, direct, or migration to ground water closure levels for a given chemical. Default closure levels are considered protective of human health.

The ground water section provides concentrations for water solubility limits, maximum contaminant levels (MCL), and the respective ground water pathway closure levels. The default closure level for residential settings is the MCL, if the MCL has been established; if not, the default closure level is the lowest of either the ground water pathway or the solubility limit. The ground water default closure level for the commercial/industrial setting is the solubility limit if it is lower than any other level; if not, the default closure level is the highest of either the MCL or the ground water pathway level.

The default closure levels for all compounds, except beryllium and mercury, are used over a default soil pH range of 6.0 to 8.0. If site soils have a pH within this range, the default closure levels can be applied. If not, a site-specific, pH-dependent closure level must be developed for any ionizing organics and metals at the site. The K_d-dependent pH range applies only to metals and ionizing organics. These compounds are identified in the default closure level tables by footnote 6. In general, carboxylic acids, phenols, and amines are considered “ionizing organics.” For those metals or ionizing organics not included in the table, a pH-specific K_{oc} or K_d will need to be determined. Guidance for determining the K_d or K_{oc} is presented in the 1996 EPA Soil Screening Guidance (EPA 540/R-95/128). K_d values for beryllium and mercury are very sensitive to slight changes

in pH; therefore, a site-specific pH must be established and used to determine the K_d for these compounds. This value can be calculated by using Table C-4, Metal K_d Values as a Function of pH, as presented in the EPA 1996 Soil Screening Guidance Users Guide (EPA/540/R-96-018).

Table B

Table B presents values for the following chemical and physical properties used to derive the values listed in Table A:

- Volatilization Factor
  - Diffusivity in air
  - Diffusivity in water
- K_{oc}/ Kd
- Henry's Law Constant
- Dermal absorbance
- Water solubility
- Maximum contaminant level (MCL)
- Melting point
- Boiling point
- Molecular weight

The chemical and physical parameter values were taken from the following references (in order of preference):

1. EPA. 1996. Soil Screening Guidance Document, Users Guide, 9355.4-23, EPA/540/R-96/018, April; Technical Background Document, 9355.4-17A, EPA/540/R-95/128, May.

2. Agency for Toxic Substances and Disease Registry Toxicological Profiles

3. EPA Region 9, Region 6, and Region 3 Preliminary Remediation Goals, Physical and Chemical Parameters; available online at: http://www.epa.gov/reg3hwmd/risk/riskmenu.htm http://www.epa.gov/region09/waste/sfund/prg/index.htm and http://www.epa.gov/earth1r6/6pd/cra_c/pd-n/screen.htm

4. Other EPA sources, including the Superfund Chemical Data Matrix

5. Other State agency sources

6. Other published literature

Table C

Table C presents mathematical equations used to derive closure levels. The RISC default process considers three media of exposure or pathways for commercial/industrial and residential land uses: surface soil, subsurface soil, and ground water. Subsurface soil is considered a medium because it presents a mechanism for contaminant transport to ground water when rain infiltrates and leaches material out of the soil. For this reason, the equations describing calculation of subsurface soil default closure levels are titled *Migration to Groundwater*; they are often referred to as "indirect" exposure pathway equations. The total exposure associated with each medium is the sum of the exposures from each significant absorption route (ingestion, dermal absorption, and inhalation) associated with that medium. The construction worker occupational exposure considers only soil exposure.

Residential and industrial direct soil exposure is determined by summing the intake from the ingestion, inhalation, and dermal absorption routes. Values listed for exposure resulting from soil contaminants migrating to ground water are protective for the ground water consumption pathway. Residential ground water exposure is determined by summing the intake from the inhalation and ingestion routes. Certain exposure routes in a given pathway were eliminated after considering potential exposure and dosage. The dermal route for residential ground water was assessed as an insignificant contributor to risk and was therefore eliminated from the calculation. Similarly, the inhalation route for industrial ground water was eliminated because industrial settings are typically well ventilated, and it is unlikely that most workers have any significant exposure.

Construction closure levels consider the intake from ingestion, dermal, and inhalation routes for direct soil contact. Water exposure was not considered because most utility or other construction work does not involve workers standing in water for long periods of time.

Separate equations are needed to determine carcinogenic and noncarcinogenic closure levels. Many compounds have both a carcinogenic and noncarcinogenic dose response. In such cases, each value was calculated separately, and the lowest result is used in the table.

Exposure to residential soil presents more significant exposure risks in children 6 years and younger. Children in this age group generally spend more time outdoors and ingest more soil than adults. To account for this special case, a "weighted approach" was used to calculate residential surface soil values. The body weight, exposure duration, skin-surface area, ingestion amounts, and inhalation rates were age-adjusted or "weighted" for each of the three principle soil absorption routes.

Five supporting models were used to account for the following factors: volatilization factor/particulate emissions, soil saturation, age adjustments for soil ingestion, skin contact, and vapor inhalation. The volatilization and particulate emission models account for exposure potential for emission of vapors and particulates from surface soils. The models and equations are taken from the EPA Soil Screening Guidance (1996). Similarly, the models used for soil saturation levels were also taken from the Soil Screening Guidance. The equations (models) used to adjust values based on age were mathematically derived using exposure duration, body weight, skin surface area, and ingestion and inhalation rates of children and adults.

Tables D and E

Table D presents the Default Exposure Assumptions used in the equations presented in Table C. Quantification of exposure variables (such as exposure frequency, exposure duration, and exposed surface area) will change depending on land use, application, and whether the receptors are adults or children. Table E lists a reference source verifying each default value.

Generally speaking, the default assumption values are set at the 90 to 95th percentile of available and reliable data. This approach is more protective than using the average value and it is generally accepted as a reasonable working boundary on the population of sampled measurements (see EPA Risk Assessment Guidance for Superfund, EPA/540/1-89/002).

Table F

Table F presents the reference doses and slope factors for all of the chemicals listed in the closure tables. These values were taken from the following references (in order of preference):

1. EPA Integrated Risk Information System (IRIS) — Certain route-to-route extrapolations are acceptable. Guidance is presented below.

2. Health Effects Assessment Summary Tables (HEAST) — Assuming HEAST continues to be updated (if not, then this source moves to "Other Literature Sources").

3. Agency for Toxic Substances and Disease Registry (ATSDR), National Center for Environmental Assessment, and EPA Regions 9 and 3 PRG Toxicity Values

4. Other literature sources — This may include derivations from literature sources.

5. Predictive Models — Predictive models such as Quantitative Structure and Activity Relationship (QSARS)

In general, the organic chemicals in the default tables have both an inhalation and an oral reference dose (RfD) or slope factor (SF). These values are taken directly from experimentally derived animal or human data (when available). When sufficient data on the route was not available, IDEM used a route-to-route extrapolation. This approach assumes that toxicity is similar for both routes. While it is unlikely that there is a direct 1-to-1 correlation between the inhalation and oral routes, extrapolation of inhalation RfDs from oral RfDs for the more volatile chemicals tends to be reasonably close when compared to experimentally derived inhalation RfDs (EPA Soil Screening Guidance 1996).

IDEM considers such extrapolations of values for the more volatile compounds to compare reasonably well and will use route-to-route extrapolations. As the volatility of the compounds decreases, route-to-route extrapolations become less certain (EPA Soil Screening Guidance 1996). However, these extrapolations do provide some assurance that the pathways are being addressed, and IDEM will also use route-to-route extrapolations for these compounds.

Route-to-route extrapolations do not work as well for inorganics. For the carcinogenic metals, specifically beryllium, chromium, nickel, and cadmium, the experimental evidence involving increased cancer risk appears to be limited to the respiratory pathway, and it is unlikely that ingestion would contribute to the carcinogenic response. Therefore, a route-to-route extrapolation has not been performed.

With respect to noncarcinogenic inorganics, considerable difference exists in the absorption and toxicity dynamics between routes. The differences are significant enough to eliminate them from consideration for route-to-route extrapolation. In addition, IDEM's

analysis of these compounds at default particulate exposure levels indicates that the particulate inhalation pathway is insignificant. IRIS and EPA Regions 3, 6, and 9 do not perform route-to-route extrapolations for inorganics. IDEM agrees with EPA and will not include the route-to-route extrapolation as a pathway for inorganic compounds. Therefore, route-to-route extrapolations were not performed for noncarcinogenic inorganic compounds.

Table G

The RISC default approach uses the "critical effect" of a noncarcinogenic chemical to establish the target organ. The critical effect is the first adverse effect, or its known precursor, that occurs to the most sensitive species as the dose is increased during toxicity testing. Therefore, it is a toxic effect on a target organ or tissue (for example, an increase in liver weight or nephrotoxicity). Each critical effect will be categorized into one or more "critical effects categories." A critical effects category is a group of target organs or tissues subject to common absorption or a group of organs with similar or common functions. In certain cases, an effect occurring in one system may indirectly affect another system, and it will be necessary to consider effects as additive within both systems. In other cases, a chemical at the RfD dose may affect more than one critical effects category. Many chemicals have both a carcinogenic and a noncarcinogenic toxic effect. If the default value in the closure table is based on the carcinogenic response, then the additivity of the chemical is assessed only as a carcinogen.

The box on the following page lists the 10 critical effects categories and examples of the target organs or effects considered in that category. The list of critical effects and categories for each chemical is given in Table G.

Critical Effects Categories and Target Organs

1. Systemic: Liver, kidney, urinary tract
2. Circulatory: Arteries, veins, heart, and blood
3. Gastrointestinal: Buccal cavity, esophagus, stomach, intestines, and gall bladder
4. Musculoskeletal: Muscles, bone, and connective tissues
5. Respiratory: Lungs, trachea, and nasal passageway
6. Immunological: Lymph and tissue fluid, spleen, and lymph nodes

7. Neurological: Brain, spinal cord, and neurons
8. Reproductive/Endocrine: Testes, ovaries, thyroid, adrenal, pituitary, pancreas, and parathyroid
9. Developmental: Teratology, growth retardation, structural malformations, and abnormal development
10. Dermal/ Ocular: Skin and eyes

The primary critical effect and target organ for each chemical was obtained using the following sources (in order of preference):

1. IRIS (EPA 2000)
2. HEAST (EPA 1997)
3. ATSDR Toxicological Profiles
4. Hazardous Substance Databank (http://toxnet.nlm.nih.gov)

Exceptions include the following critical effects and target organs:

- Some compounds have an RfD based on the No Observed Adverse Effects Level (NOAEL), and information on toxic effects at higher doses was not available. In these cases, the critical effect of a surrogate compound (similar in structure and type) was used.

- Some compounds have an RfD established with the NOAEL and some toxic effects information. The toxic effects information was used to establish the critical effect.

- Some compounds have experimentally derived oral and inhalation reference doses. Where these values were within an order of magnitude of each other, critical effects from both routes were listed. These compounds should be considered as additive in both categories.

- Some compounds did not have an easily identified target organ within the critical effects category. These compounds were classified within a category as “nonspecific.”

Table A

Residential Closure Levels
Commercial/Industrial Closure Levels

Table A	**Default**	**Closure**	**Residential**										**January 1, 2004**		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Residential		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Acenaphthene	83-32-9	6000/2000		50,000	NC	9,500	NC	130	NC	130	4.2		0.46	NC	0.46
Acenaphthylene	208-96-8	6000/2000		5,900	NC	1,100	NC	18	NC	18	3.9		0.071	NC	0.071
Acetone (2-Propanone)	67-64-1	6000/2000	200,000	34,000	NC	4,800	NC	3.8	NC	3.8	1,000,000		0.95	NC	0.95
Acrolein [5]	107-02-8	6000/2000	50,000	3.5	NC	0.5	NC	0.00027	NC	0.00027	210,000		0.000055	NC	0.000055
Aldrin	309-00-2	6000/2000		27	NC	0.25	C	4.9	C	0.25	0.18		0.00005	C	0.00005
Anthracene	120-12-7	6000/2000		250,000	NC	47,000	NC	51	NC	51	0.043		2.3	NC	0.043
Antimony and compounds [6]	7440-36-0	10,000		460	NC	140	NC	5.4	NC	5.4		0.006	0.015	NC	0.006
Arsenic [3,6]	7440-38-2	10,000		320	NC	3.9		29	C	3.9		0.05	0.00057	C	0.05
Barium [6]	7440-39-3	10,000		79,000	NC	23,000	NC	1,600	NC	1,600		2	2.6	NC	2
Benzene	71-43-2	6000/2000	590	560	NC	7.8	C	0.034	C	0.034	1,800	0.005	0.0052	C	0.005
Benzo(a)anthracene	56-55-3	6000/2000		790	C	5	C	19	C	5	0.0094		0.0012	C	0.0012
Benzo(a)pyrene	50-32-8	6000/2000		79	C	0.5	C	8.2	C	0.5	0.0016	0.0002	0.00012	C	0.0002
Benzo(b)fluoranthene	205-99-2	6000/2000		790	C	5	C	57	C	5	0.0015		0.0012	C	0.0012
Benzo(g,h,i)perylene [14]	191-24-2	6000/2000		7,900	C	50	C	16	C	16	0.00026		0.012	C	0.00026
Benzo(k)fluoranthene [14]	207-08-9	6000/2000		7,900	C	50	C	39	C	39	0.0008		0.012	C	0.0008
Benzoic acid [6]	65-85-0	6000/2000		1,000,000	NC	730,000	NC	590	NC	590	3,500		150	NC	150
Benzyl Alcohol	100-51-6	6000/2000	8,800	270,000	NC	55,000	NC	48	NC	48	40,000		11	NC	11
Beryllium and compunds [9]	7440-41-7	10,000		2,300	NC	680	NC	63	C	63		0.004	0.073	NC	0.004
Bis(2-chloro-1-methylethyl) ether	108-60-1	6000/2000	550	5,200	C	30	C	0.027	C	0.027	1,700		0.0042	C	0.0042
Bis(2-Chloroethyl)ether [5]	111-44-4	6000/2000	4,000	280	C	1.6	C	0.0007	C	0.0007	17,000		0.00015	C	0.00015
Bis(2-chloroisopropyl)ether	39638-32-9	6000/2000	550	5,200	C	30	C	0.027	C	0.027	1,700		0.0042	C	0.0042
Bis(2-ethylhexyl)phthalate	117-81-7	6000/2000	10,000	18,000	NC	300	C	3,600	C	300	0.34	0.006	0.061	C	0.006
Bromodichloromethane [7]	75-27-4	6000/2000	2,100	2,100	C	10	C	0.51	C	0.51	6,700	0.08	0.0029	C	0.08
Bromoform(tribromomethane) [7]	75-25-2	6000/2000	1,200	7,700	NC	280	C	0.6	C	0.6	3,100	0.08	0.11	C	0.08
n-Butanol	71-36-3	6000/2000	16,000	2,700	NC	380	NC	16	NC	16	74,000		3.7	NC	3.7
Butylbenzylphthalate [2,14]	85-68-7	6000/2000	310	180,000	NC	37,000	NC	6,200	NC	310	2.7		7.3	NC	2.7
Cadmium [3,6]	7440-43-9	10,000		590	NC	12		7.5	C	7.5		0.005	0.018	NC	0.005
Carbazole	86-74-8	6000/2000		31,000	C	210	C	5.9	C	5.9	7.5		0.043	C	0.043
Carbon disulfide	75-15-0	6000/2000	480	6,200	NC	900	NC	10	NC	10	1,200		1.3	NC	1.3
Carbon tetrachloride	56-23-5	6000/2000	520	31	NC	3.3	C	0.066	C	0.066	790	0.005	0.0026	C	0.005
Chlordane	12789-03-6	6000/2000		510	NC	17	C	9.6	C	9.6	0.056	0.002	0.0024	C	0.002
p-Chloroaniline [6]	106-47-8	6000/2000		3,600	NC	730	NC	0.97	NC	0.97	5,300		0.15	NC	0.15
Chlorobenzene	108-90-7	6000/2000	310	2,600	NC	380	NC	1.3	NC	1.3	470	0.1	0.13	NC	0.1
Chloroethane	75-00-3	6000/2000	3,000	16,000	C	80	C	0.65	C	0.65	5,700		0.062	C	0.062
Chloroform [7,10]	67-66-3	6000/2000	2,300	6.4	NC	0.91	NC	0.47	C	0.47	7,900	0.08	0.00084	NC	0.08
2-Chloronapthalene	91-58-7	6000/2000		71,000	NC	15,000	NC	42	NC	42	12		0.61	NC	0.61
2-Chlorophenol [6]	95-57-8	6000/2000	22,000	2,200	NC	360	NC	0.75	NC	0.75	22,000		0.038	NC	0.038

Table A	**Default**	**Closure**	**Residential**										**January 1, 2004**		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Residential		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Chromium III [6]	16065-83-1	10,000		1,000,000	NC	520,000	NC	1,000,000	NC	10,000		0.1	55	NC	0.1
Chromium VI [6,12]	18540-29-9	10,000		3,400	NC	430	C	38	C	38		0.1	0.11	NC	0.1
Chrysene [14]	218-01-9	6000/2000		79,000	C	500	C	25	C	25	0.0016		0.12	C	0.0016
Copper [6]	7440-50-8	10,000		42,000	NC	13,000	NC	920	NC	920		1.3	1.4	NC	1.3
Cyanide, Free [13]	57-12-5	6000/2000	0	23,000	NC	6,900	NC	0.94	NC	0.94	1,000,000	0.2	0.73	NC	0.2
Cyclohexane [2]	110-82-7	6000/2000	69	51,000	NC	7,200	NC	330	NC	69	55		13	NC	13
DDD	72-54-8	6000/2000		3,100	C	28	C	140	C	28	0.09		0.0035	C	0.0035
DDE	72-55-9	6000/2000		2,200	C	20	C	450	C	20	0.12		0.0025	C	0.0025
DDT	50-29-3	6000/2000		540	NC	20	C	260	C	20	0.025		0.0025	C	0.0025
Dibenzo(a,h)anthracene	53-70-3	6000/2000		79	C	0.5	C	18	C	0.5	0.0025		0.00012	C	0.00012
Dibenzofuran	132-64-9	6000/2000		1,800	NC	370	NC	4.9	NC	4.9	3.1		0.015	NC	0.015
1,2-Dichlorobenzene	95-50-1	6000/2000	220	18,000	NC	2,800	NC	17	NC	17	160	0.6	0.48	NC	0.6
1,3-Dichlorobenzene	541-73-1	6000/2000	230	250	NC	40	NC	0.2	NC	0.2	160		0.0069	NC	0.0069
1,4-Dichlorobenzene	106-46-7	6000/2000		8,000	C	42	C	2.2	C	2.2	74	0.075	0.008	C	0.075
3,3-Dichlorobenzidine	91-94-1	6000/2000		1,400	C	9.5	C	0.062	C	0.062	3.1		0.0019	C	0.0019
1,1-Dichloroethane	75-34-3	6000/2000	1,400	8,600	NC	1,300	NC	5.6	NC	5.6	5,100		0.99	NC	0.99
1,2-Dichloroethane	107-06-2	6000/2000	2,000	150	NC	3.7	C	0.024	C	0.024	8,500	0.005	0.002	C	0.005
1,1-Dichloroethylene	75-35-4	6000/2000	930	2,200	NC	310	NC	0.058	NC	0.058	2,300	0.007	0.43	NC	0.007
cis-1,2-Dichloroethylene	156-59-2	6000/2000	1,000	750	NC	110	NC	0.4	NC	0.4	3,500	0.07	0.077	NC	0.07
trans-1,2-Dichloroethylene	156-60-5	6000/2000	2,100	1,200	NC	180	NC	0.68	NC	0.68	6,300	0.1	0.15	NC	0.1
2,4-Dichlorophenol [6]	120-83-2	6000/2000		2,700	NC	550	NC	1.1	NC	1.1	4,500		0.11	NC	0.11
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	6000/2000		9,100	NC	2,000	NC	0.35	NC	0.35	680	0.07	0.37	NC	0.07
1,2-Dichloropropane	78-87-5	6000/2000	830	100	NC	4.5	C	0.03	C	0.03	2,800	0.005	0.0026	C	0.005
1,3-Dichloropropene	542-75-6	6000/2000	1,000	290	NC	9.5	C	0.04	C	0.04	2,800		0.0056	C	0.0056
Dieldrin	60-57-1	6000/2000		39	C	0.27	C	0.046	C	0.046	0.2		0.000053	C	0.000053
Diethylphthalate	84-66-2	6000/2000	840	710,000	NC	150,000	NC	450	NC	450	1,100		29	NC	29
2,4-Dimethylphenol [6]	105-67-9	6000/2000		18,000	NC	3,700	NC	9	NC	9	7,900		0.73	NC	0.73
Dimethylphthalate [2]	131-11-3	6000/2000	1,100	1,000,000	NC	1,000,000	NC	2,000	NC	1,100	4,000		370	NC	370
Di-n-butyl phthalate [2]	84-74-2	6000/2000	760	89,000	NC	18,000	NC	5,000	NC	760	11		3.7	NC	3.7
2,4-Dinitrophenol [6]	51-28-5	6000/2000		1,800	NC	370	NC	0.29	NC	0.29	2,800		0.073	NC	0.073
Dinitrotoluene mixture	25321-14-6	6000/2000		890	NC	6.3	C	0.0091	C	0.0091	230		0.0013	C	0.0013
Di-n-octyl phthalate [14]	117-84-0	6000/2000	3,300	18,000	NC	3,700	NC	67,000	NC	2,000	0.02		0.73	NC	0.02
Endosulfan	115-29-7	6000/2000		5,300	NC	1,100	NC	20	NC	20	0.51		0.22	NC	0.22
Endrin	72-20-8	6000/2000		270	NC	55	NC	0.99	NC	0.99	0.25	0.002	0.011	NC	0.002
Ethylbenzene	100-41-4	6000/2000	160	29,000	NC	4,600	NC	13	NC	13	170	0.7	1.6	NC	0.7
Fluoranthene [14]	206-44-0	6000/2000		33,000	NC	6,300	NC	880	NC	880	0.21		1.5	NC	0.21
Fluorene	86-73-7	6000/2000		33,000	NC	6,300	NC	170	NC	170	2		0.31	NC	0.31
alpha-HCH(alpha-BHC)	319-84-6	6000/2000		120	C	0.99	C	0.0072	C	0.0072	2		0.00014	C	0.00014
beta-HCH(beta-BHC)	319-85-7	6000/2000		410	C	3.5	C	0.026	C	0.026	0.24		0.00047	C	0.00047

Table A	**Default**	**Closure**	**Residential**										**January 1, 2004**		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Residential		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
gamma-HCH(Lindane)	58-89-9	6000/2000		310	NC	4.8	C	0.0094	C	0.0094	6.8	0.0002	0.00066	C	0.0002
Heptachlor	76-44-8	6000/2000		140	C	0.93	C	23	C	0.93	0.18	0.0004	0.00019	C	0.0004
Heptachlor epoxide	1024-57-3	6000/2000		12	NC	0.47	C	0.67	C	0.47	0.2	0.0002	0.000094	C	0.0002
Hexachloro-1,3-butadiene	87-68-3	6000/2000	350	180	NC	37	NC	16	C	16	3.2		0.0073	NC	0.0073
Hexachlorobenzene	118-74-1	6000/2000		390	C	2.7	C	2.2	C	2.2	6.2	0.001	0.00053	C	0.001
Hexachlorocyclopentadiene	77-47-4	6000/2000	720	5,300	NC	1,100	NC	400	NC	400	1.8	0.05	0.22	NC	0.05
Hexachloroethane	67-72-1	6000/2000		660	NC	120	NC	2.8	C	2.8	50		0.037	NC	0.037
n-Hexane	110-54-3	6000/2000	100	1,200	NC	170	NC	97	NC	97	9.5		0.44	NC	0.44
Indeno(1,2,3-cd)pyrene [14]	193-39-5	6000/2000		790	C	5	C	3.1	C	3.1	0.000022		0.0012	C	0.000022
Iodomethane	74-88-4	6000/2000	3,600	620	C	4.3	C	0.0044	C	0.0044	14,000		0.00085	C	0.00085
Isophorone	78-59-1	6000/2000	3,500	180,000	NC	4,500	C	5.3	C	5.3	12,000		0.9	C	0.9
Lead [8]	7439-92-1	10,000		970	NC	400	NC	81	NC	81		0.015	.015	NC	0.015
Mercury and compounds [9]	7439-97-6	10,000		340	NC	100	NC	2.1	NC	2.1	69,000	0.002	0.011	NC	0.002
Methoxychlor [14]	72-43-5	6000/2000		4,400	NC	910	NC	160	NC	160	0.045	0.04	0.18	NC	0.04
Methyl bromide (bromomethane)	74-83-9	6000/2000	3,700	69	NC	9.9	NC	0.052	NC	0.052	15,000		0.011	NC	0.011
Methyl ethyl ketone (MEK)	78-93-3	6000/2000	28,000	260,000	NC	44,000	NC	35	NC	35	140,000		8.4	NC	8.4
Methyl tertiary butyl ether (MTBE) [16]	1634-04–4	6000/2000	11,000	110,000	NC	670	C	0.18	C	0.18	48,000		0.18	C	0.04
4-Methyl-2-pentanone (MIBK)	108-10-1	6000/2000	8,700	64,000	NC	12,000	NC	20	NC	20	19,000		2.2	NC	2.2
Methylene chloride	75-09-2	6000/2000	3,000	22,000	C	120	C	0.023	C	0.023	13,000	0.005	0.063	C	0.005
2-Methylnaphthalene	91-57-6	6000/2000		17,000	NC	3,200	NC	16	NC	16	25		0.15	NC	0.15
3-Methylphenol (m-cresol) [6]	108-39-4	6000/2000	6,100	44,000	NC	9,100	NC	9.8	NC	9.8	23,000		1.8	NC	1.8
4-Methylphenol (p-cresol) [6]	106-44-5	6000/2000		4,400	NC	910	NC	1.1	NC	1.1	22,000		0.18	NC	0.18
2-Methylphenol(o-cresol) [6]	95-48-7	6000/2000		39,000	NC	7,500	NC	14	NC	14	26,000		1.8	NC	1.8
Naphthalene	91-20-3	6000/2000		17,000	NC	3,200	NC	0.7	NC	0.7	31		0.0083	NC	0.0083
Nickel, soluble salts [6]	various	10,000		23,000	NC	6,900	NC	950	C	950			0.73	NC	0.73
2-Nitroaniline	88-74-4	6000/2000		51	NC	10	NC	0.013	NC	0.013	1,500		0.0021	NC	0.0021
Nitrobenzene	98-95-3	6000/2000	690	440	NC	91	NC	0.028	NC	0.028	2,100		0.0043	NC	0.0043
N-Nitrosodi-n-propylamine [5,6]	621-64-7	6000/2000	2,500	89	C	0.61	C	0.0006	C	0.0006	9,900		0.00012	C	0.00012
N-Nitrosodiphenylamine [6]	86-30-6	6000/2000		130,000	C	870	C	9.7	C	9.7	35		0.17	C	0.17
PCBs (polychorinated biphenyls) [11]	1336-36-3	6000/2000		16	NC	1.8	C	6.2	C	1.8	0.7	0.0005	0.00043	C	0.0005
Pentachlorophenol [6]	87-86-5	6000/2000		3,800	C	20	C	0.028	C	0.028	2,000	0.001	0.0071	C	0.001
Phenanthrene	85-01-8	6000/2000		2,500	NC	470	NC	13	NC	13	1.2		0.023	NC	0.023
Phenol [6]	108-95-2	6000/2000		230,000	NC	44,000	NC	56	NC	56	83,000		11	NC	11
Pyrene [14]	129-00-0	6000/2000		25,000	NC	4,700	NC	570	NC	570	0.14		1.1	NC	0.14
Selenium [6]	7782-49-2	10,000		5,700	NC	1,700	NC	5.2	NC	5.2		0.05	0.18	NC	0.05
Silver [6]	7440-22-4	10,000		5,700	NC	1,700	NC	31	NC	31			0.18	NC	0.18
Styrene	100-42-5	6000/2000	550	68,000	NC	11,000	NC	3.5	NC	3.5	310	0.1	2	NC	0.1
1,1,1,2-Tetrachloroethane	630-20-6	6000/2000	1,200	7,400	C	39	C	0.053	C	0.053	3,000		0.0069	C	0.0069
1,1,2,2-Tetrachloroethane	79-34-5	6000/2000	1,200	960	C	5	C	0.007	C	0.007	3,000		0.0009	C	0.0009

Table A	**Default**	**Closure**	**Residential**										**January 1, 2004**		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Residential		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Tetrachloroethylene (PCE)	127-18-4	6000/2000	120	720	NC	16	C	0.058	C	0.058	200	0.005	0.0088	C	0.005
Thallium (and compounds) [6]	7440-28-0	10,000		80	NC	24	NC	2.8	NC	2.8		0.002	0.0026	NC	0.002
Toluene	108-88-3	6000/2000	310	11,000	NC	1,700	NC	12	NC	12	530	1	0.93	NC	1
Toxaphene	8001-35-2	6000/2000		560	C	3.9	C	31	C	3.9	0.74	0.003	0.00077	C	0.003
1,2,4-Trichlorobenzene	120-82-1	6000/2000	1,100	8,900	NC	1,800	NC	5.3	NC	5.3	300	0.07	0.22	NC	0.07
1,1,1-Trichloroethane	71-55-6	6000/2000	640	34,000	NC	5,000	NC	1.9	NC	1.9	1,300	0.2	3.8	NC	0.2
1,1,2-Trichloroethane	79-00-5	6000/2000	1,300	600	NC	9.4	C	0.03	C	0.03	4,400	0.005	0.0032	C	0.005
Trichloroethylene (TCE)	79-01-6	6000/2000	630	150	C	0.71	C	0.057	C	0.057	1,100	0.005	0.00045	C	0.005
2,4,5-Trichlorophenol [6]	95-95-4	6000/2000		89,000	NC	18,000	NC	250	NC	250	1,200		3.7	NC	3.7
2,4,6-Trichlorophenol [6]	88-06-2	6000/2000		89	NC	18	NC	0.07	C	0.07	800		0.0037	NC	0.0037
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	6000/2000		8,900	NC	1,800	NC	2.2	NC	2.2	270		0.37	NC	0.37
1,2,4-Trimethylbenzene	95-63-6	6000/2000	430	920	NC	130	NC	2.5	NC	2.5	57		0.016	NC	0.016
1,3,5-Trimethylbenzene	108-67-8	6000/2000	90	380	NC	54	NC	0.61	NC	0.61	48		0.016	NC	0.016
Vinyl acetate	108-05-4	6000/2000	4,200	7,600	NC	1,100	NC	2.3	NC	2.3	20,000		0.55	NC	0.55
Vinyl chloride (chloroethene) [15]	75-01-4	6000/2000	930	250	C	1.5	C	0.013	C	0.013	2,800	0.002	0.00053	C	0.002
Xylene mixed (total)	1330-20-7	6000/2000	170	4,800	NC	690	NC	210	NC	170	160	10	0.27	NC	10
Zinc [6]	7440-66-6	10,000		340,000	NC	100,000	NC	14,000	NC	10,000			11	NC	11

Table A	Default	Closure	Industrial										January 1, 2004		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Industrial		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Acenaphthene [14]	83-32-9	6000/2000		50,000	NC	24,000	NC	1,200	NC	1,200	4.2		6.1	NC	4.2
Acenaphthylene	208-96-8	6000/2000		5,900	NC	2,800	NC	180	NC	180	3.9		0.73	NC	0.73
Acetone (2-Propanone)	67-64-1	6000/2000	200,000	34,000	NC	6,300	NC	370	NC	370	1,000,000		92	NC	92
Acrolein [5]	107-02-8	6000/2000	50,000	3.5	NC	0.64	NC	0.25	NC	0.25	210,000		0.051	NC	0.051
Aldrin	309-00-2	6000/2000		27	NC	0.8	C	16	C	0.8	0.18		0.00017	C	0.00017
Anthracene [14]	120-12-7	6000/2000		250,000	NC	120,000	NC	51	NC	51	0.043		31	NC	0.043
Antimony and compounds [6]	7440-36-0	10,000		460	NC	620	NC	37	NC	37		0.006	0.041	NC	0.041
Arsenic [6]	7440-38-2	10,000		320	NC	20	C	29	C	20		0.05	0.0019	C	0.05
Barium [6]	7440-39-3	10,000		79,000	NC	98,000	NC	5,900	NC	5,900		2	7.2	NC	7.2
Benzene	71-43-2	6000/2000	590	560	NC	13	C	0.35	C	0.35	1,800	0.005	0.052	C	0.052
Benzo(a)anthracene	56-55-3	6000/2000		790	C	15	C	62	C	15	0.0094		0.0039	C	0.0039
Benzo(a)pyrene	50-32-8	6000/2000		79	C	1.5	C	16	C	1.5	0.0016	0.0002	0.00039	C	0.00039
Benzo(b)fluoranthene [14]	205-99-2	6000/2000		790	C	15	C	74	C	15	0.0015		0.0039	C	0.0015
Benzo(g,h,i)perylene [14]	191-24-2	6000/2000		7,900	C	150	C	16	C	16	0.00026		0.039	C	0.00026
Benzo(k)fluoranthene [14]	207-08-9	6000/2000		7,900	C	150	C	39	C	39	0.0008		0.039	C	0.0008
Benzoic acid [6]	65-85-0	6000/2000		1,000,000	NC	1,000,000	NC	1,600	NC	1,600	3,500		410	NC	410
Benzyl Alcohol	100-51-6	6000/2000	8,800	270,000	NC	150,000	NC	140	NC	140	40,000		31	NC	31
Beryllium and compunds [9]	7440-41-7	10,000		2,300	NC	2,900	NC	3,200	C	2,300		0.004	0.2	NC	0.2
Bis(2-chloro-1-methylethyl) ether	108-60-1	6000/2000	550	5,200	C	61	C	0.26	C	0.26	1,700		0.041	C	0.041
Bis(2-Chloroethyl)ether [5]	111-44-4	6000/2000	4,000	280	C	3	C	0.012	C	0.012	17,000		0.0026	C	0.0026
Bis(2-chloroisopropyl)ether	39638-32-9	6000/2000	550	5,200	C	61	C	0.26	C	0.26	1,700		0.041	C	0.041
Bis(2-ethylhexyl)phthalate	117-81-7	6000/2000	10,000	18,000	NC	980	C	120,000	C	980	0.34	0.006	0.2	C	0.2
Bromodichloromethane [7]	75-27-4	6000/2000	2,100	2,100	C	17	C	0.51	C	0.51	6,700	0.08	0.046	C	0.08
Bromoform(tribromomethane) [7]	75-25-2	6000/2000	1,200	7,700	NC	580	C	2.7	C	2.7	3,100	0.08	0.36	C	0.36
n-Butanol	71-36-3	6000/2000	16,000	2,700	NC	490	NC	44	NC	44	74,000		10	NC	10
Butylbenzylphthalate [2,14]	85-68-7	6000/2000	310	180,000	NC	98,000	NC	6,200	NC	310	2.7		20	NC	2.7
Cadmium [6]	7440-43-9	10,000		590	NC	990	NC	77	C	77		0.005	0.051	NC	0.051
Carbazole	86-74-8	6000/2000		31,000	C	690	C	20	C	20	7.5		0.14	C	0.14
Carbon disulfide	75-15-0	6000/2000	480	6,200	NC	1,200	NC	82	NC	82	1,200		10	NC	10
Carbon tetrachloride	56-23-5	6000/2000	520	31	NC	5.2	C	0.29	C	0.29	790	0.005	0.022	C	0.022
Chlordane	12789-03-6	6000/2000		510	NC	68	C	39	C	39	0.056	0.002	0.0082	C	0.0082
p-Chloroaniline [6]	106-47-8	6000/2000		3,600	NC	2,000	NC	2.7	NC	2.7	5,300		0.41	NC	0.41
Chlorobenzene	108-90-7	6000/2000	310	2,600	NC	510	NC	27	NC	27	470	0.1	2	NC	2
Chloroethane	75-00-3	6000/2000	3,000	16,000	C	120	C	10	C	10	5,700		0.99	C	0.99
Chloroform [7,10]	67-66-3	6000/2000	2,300	6.4	NC	1.2	NC	6	C	1.2	7,900	0.08	1	NC	1
2-Chloronapthalene	91-58-7	6000/2000		71,000	NC	39,000	NC	560	NC	560	12		8.2	NC	8.2
2-Chlorophenol [6]	95-57-8	6000/2000	22,000	2,200	NC	580	NC	10	NC	10	22,000		0.51	NC	0.51

Table A	Default	Closure	Industrial										January 1, 2004		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Industrial		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Chromium III [6]	16065-83-1	10,000		1,000,000	NC	1,000,000	NC	1,000,000	NC	10,000		0.1	150	NC	150
Chromium VI [6,12]	18540-29-9	10,000		3,400	NC	650	C	120	C	120		0.1	0.31	NC	0.31
Chrysene [14]	218-01-9	6000/2000		79,000	C	1,500	C	25	C	25	0.0016		0.39	C	0.0016
Copper [6]	7440-50-8	10,000		42,000	NC	57,000	NC	2,700	NC	2,700		1.3	3.8	NC	3.8
Cyanide, Free [13]	57-12-5	6000/2000	0	23,000	NC	31,000	NC	9.6	NC	9.6	1,000,000	0.2	2	NC	2
Cyclohexane [2,14]	110-82-7	6000/2000	69	51,000	NC	9,300	NC	1,400	NC	69	55		170	NC	55
DDD	72-54-8	6000/2000		3,100	C	120	C	480	C	120	0.09		0.012	C	0.012
DDE	72-55-9	6000/2000		2,200	C	86	C	1,500	C	86	0.12		0.0084	C	0.0084
DDT	50-29-3	6000/2000		540	NC	86	C	890	C	86	0.025		0.0084	C	0.0084
Dibenzo(a,h)anthracene	53-70-3	6000/2000		79	C	1.5	C	60	C	1.5	0.0025		0.00039	C	0.00039
Dibenzofuran	132-64-9	6000/2000		1,800	NC	980	NC	65	NC	65	3.1		0.2	NC	0.2
1,2-Dichlorobenzene [2]	95-50-1	6000/2000	220	18,000	NC	3,900	NC	270	NC	220	160	0.6	9.2	NC	9.2
1,3-Dichlorobenzene	541-73-1	6000/2000	230	250	NC	58	NC	2.7	NC	2.7	160		0.092	NC	0.092
1,4-Dichlorobenzene	106-46-7	6000/2000		8,000	C	73	C	3.4	C	3.4	74	0.075	0.12	C	0.12
3,3-Dichlorobenzidine	91-94-1	6000/2000		1,400	C	31	C	0.21	C	0.21	3.1		0.0064	C	0.0064
1,1-Dichloroethane	75-34-3	6000/2000	1,400	8,600	NC	1,700	NC	58	NC	58	5,100		10	NC	10
1,2-Dichloroethane	107-06-2	6000/2000	2,000	150	NC	5.8	C	0.15	C	0.15	8,500	0.005	0.031	C	0.031
1,1-Dichloroethylene	75-35-4	6000/2000	930	2,200	NC	410	NC	42	NC	42	2,300	0.007	5.1	NC	5.1
cis-1,2-Dichloroethylene	156-59-2	6000/2000	1,000	750	NC	140	NC	5.8	NC	5.8	3,500	0.07	1	NC	1
trans-1,2-Dichloroethylene	156-60-5	6000/2000	2,100	1,200	NC	230	NC	14	NC	14	6,300	0.1	2	NC	2
2,4-Dichlorophenol [6]	120-83-2	6000/2000		2,700	NC	1,500	NC	3	NC	3	4,500		0.31	NC	0.31
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	6000/2000		9,100	NC	5,200	NC	5.2	NC	5.2	680	0.07	1	NC	1
1,2-Dichloropropane	78-87-5	6000/2000	830	100	NC	7.2	C	0.25	C	0.25	2,800	0.005	0.042	C	0.042
1,3-Dichloropropene	542-75-6	6000/2000	1,000	290	NC	16	C	0.2	C	0.2	2,800		0.029	C	0.029
Dieldrin	60-57-1	6000/2000		39	C	0.86	C	0.15	C	0.15	0.2		0.00018	C	0.00018
Diethylphthalate	84-66-2	6000/2000	840	710,000	NC	390,000	NC	1,300	NC	840	1,100		82	NC	82
2,4-Dimethylphenol [6]	105-67-9	6000/2000		18,000	NC	9,800	NC	25	NC	25	7,900		2	NC	2
Dimethylphthalate [2]	131-11-3	6000/2000	1,100	1,000,000	NC	1,000,000	NC	5,600	NC	1,100	4,000		1,000	NC	1,000
Di-n-butyl phthalate [2]	84-74-2	6000/2000	760	89,000	NC	49,000	NC	14,000	NC	760	11		10	NC	10
2,4-Dinitrophenol [6]	51-28-5	6000/2000		1,800	NC	980	NC	0.82	NC	0.82	2,800		0.2	NC	0.2
Dinitrotoluene mixture	25321-14-6	6000/2000		890	NC	20	C	0.031	C	0.031	230		0.0042	C	0.0042
Di-n-octyl phthalate [14]	117-84-0	6000/2000	3,300	18,000	NC	9,800	NC	67,000	NC	2,000	0.02		2	NC	0.02
Endosulfan [14]	115-29-7	6000/2000		5,300	NC	2,900	NC	46	NC	46	0.51		0.61	NC	0.51
Endrin	72-20-8	6000/2000		270	NC	150	NC	15	NC	15	0.25	0.002	0.031	NC	0.031
Ethylbenzene [2]	100-41-4	6000/2000	160	29,000	NC	6,800	NC	200	NC	160	170	0.7	10	NC	10
Fluoranthene [14]	206-44-0	6000/2000		33,000	NC	16,000	NC	880	NC	880	0.21		4.1	NC	0.21
Fluorene [14]	86-73-7	6000/2000		33,000	NC	16,000	NC	1,100	NC	1,100	2		4.1	NC	2
alpha-HCH(alpha-BHC)	319-84-6	6000/2000		120	C	4	C	0.024	C	0.024	2		0.00045	C	0.00045
beta-HCH(beta-BHC)	319-85-7	6000/2000		410	C	14	C	0.086	C	0.086	0.24		0.0016	C	0.0016

Table A	Default	Closure	Industrial										January 1, 2004		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Industrial		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
gamma-HCH(Lindane)	58-89-9	6000/2000		310	NC	19	C	0.1	C	0.1	6.8	0.0002	0.0022	C	0.0022
Heptachlor	76-44-8	6000/2000		140	C	2.9	C	36	C	2.9	0.18	0.0004	0.00064	C	0.00064
Heptachlor epoxide	1024-57-3	6000/2000		12	NC	1.5	C	1	C	1	0.2	0.0002	0.00031	C	0.00031
Hexachloro-1,3-butadiene	87-68-3	6000/2000	350	180	NC	98	NC	44	C	44	3.2		0.02	NC	0.02
Hexachlorobenzene	118-74-1	6000/2000		390	C	8.6	C	3.9	C	3.9	6.2	0.001	0.0018	C	0.0018
Hexachlorocyclopentadiene [2]	77-47-4	6000/2000	720	5,300	NC	2,900	NC	4,900	NC	720	1.8	0.05	0.61	NC	0.61
Hexachloroethane	67-72-1	6000/2000		660	NC	240	NC	7.7	C	7.7	50		0.1	NC	0.1
n-Hexane [2]	110-54-3	6000/2000	100	1,200	NC	220	NC	1,300	NC	100	9.5		6.1	NC	6.1
Indeno(1,2,3-cd)pyrene [14]	193-39-5	6000/2000		790	C	15	C	3.1	C	3.1	0.000022		0.0039	C	0.000022
Iodomethane	74-88-4	6000/2000	3,600	620	C	14	C	0.015	C	0.015	14,000		0.0029	C	0.0029
Isophorone	78-59-1	6000/2000	3,500	180,000	NC	14,000	C	18	C	18	12,000		3	C	3
Lead [8]	7439-92-1	10,000		970	NC	1,300	NC	230	NC	230		0.015	.042	NC	.042
Mercury and compounds [9]	7439-97-6	10,000		340	NC	470	NC	32	NC	32	69,000	0.002	0.031	NC	0.031
Methoxychlor [14]	72-43-5	6000/2000		4,400	NC	2,500	NC	180	NC	180	0.045	0.04	0.51	NC	0.045
Methyl bromide (bromomethane)	74-83-9	6000/2000	3,700	69	NC	13	NC	0.7	NC	0.7	15,000		0.14	NC	0.14
Methyl ethyl ketone (MEK)	78-93-3	6000/2000	28,000	260,000	NC	70,000	NC	250	NC	250	140,000		61	NC	61
Methyl tertiary butyl ether (MTBE)	1634-04–4	6000/2000	11,000	110,000	NC	1,400	C	3.9	C	3.9	48,000		0.87	C	0.87
4-Methyl-2-pentanone (MIBK)	108-10-1	6000/2000	8,700	64,000	NC	29,000	NC	75	NC	75	19,000		8.2	NC	8.2
Methylene chloride	75-09-2	6000/2000	3,000	22,000	C	200	C	1.8	C	1.8	13,000	0.005	0.38	C	0.38
2-Methylnaphthalene	91-57-6	6000/2000		17,000	NC	8,000	NC	210	NC	210	25		2	NC	2
3-Methylphenol (m-cresol) [6]	108-39-4	6000/2000	6,100	44,000	NC	25,000	NC	28	NC	28	23,000		5.1	NC	5.1
4-Methylphenol (p-cresol) [6]	106-44-5	6000/2000		4,400	NC	2,500	NC	3	NC	3	22,000		0.51	NC	0.51
2-Methylphenol(o-cresol) [6]	95-48-7	6000/2000		39,000	NC	17,000	NC	39	NC	39	26,000		5.1	NC	5.1
Naphthalene	91-20-3	6000/2000		17,000	NC	8,000	NC	170	NC	170	31		2	NC	2
Nickel, soluble salts	various	10,000		23,000	NC	31,000	NC	2,700	C	2,700			2	NC	2
2-Nitroaniline	88-74-4	6000/2000		51	NC	28	NC	0.036	NC	0.036	1,500		0.0058	NC	0.0058
Nitrobenzene	98-95-3	6000/2000	690	440	NC	250	NC	0.34	NC	0.34	2,100		0.051	NC	0.051
N-Nitrosodi-n-propylamine [5,6]	621-64-7	6000/2000	2,500	89	C	2	C	0.002	C	0.002	9,900		0.00041	C	0.00041
N-Nitrosodiphenylamine [6]	86-30-6	6000/2000		130,000	C	2,800	C	32	C	32	35		0.58	C	0.58
PCBs (polychorinated biphenyls) [11]	1336-36-3	6000/2000		16	NC	5.3	C	18	C	5.3	0.7	0.0005	0.0014	C	0.0014
Pentachlorophenol [6]	87-86-5	6000/2000		3,800	C	54	C	0.66	C	0.66	2,000	0.001	0.024	C	0.024
Phenanthrene	85-01-8	6000/2000		2,500	NC	1,200	NC	170	NC	170	1.2		0.31	NC	0.31
Phenol [6]	108-95-2	6000/2000		230,000	NC	96,000	NC	160	NC	160	83,000		31	NC	31
Pyrene [14]	129-00-0	6000/2000		25,000	NC	12,000	NC	570	NC	570	0.14		3.1	NC	0.14
Selenium [6]	7782-49-2	10,000		5,700	NC	7,800	NC	53	NC	53		0.05	0.51	NC	0.51
Silver [6]	7440-22-4	10,000		5,700	NC	7,800	NC	87	NC	87			0.51	NC	0.51
Styrene [2]	100-42-5	6000/2000	550	68,000	NC	16,000	NC	720	NC	550	310	0.1	20	NC	20
1,1,1,2-Tetrachloroethane	630-20-6	6000/2000	1,200	7,400	C	67	C	0.85	C	0.85	3,000		0.11	C	0.11
1,1,2,2-Tetrachloroethane	79-34-5	6000/2000	1,200	960	C	8.7	C	0.11	C	0.11	3,000		0.014	C	0.014

Table A	Default	Closure	Industrial										January 1, 2004		
Constituent	CAS	SOIL									GROUNDWATER				
		Soil Attenuation Capacity	Soil Saturation (Csat)	Construction		Soil Direct		Migration to GW		Default Closure Level	Groundwater Solubility	MCL	Industrial		Default Closure Level
		(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	(mg/l)	(mg/l)	(mg/l)		(mg/l)
Tetrachloroethylene (PCE)	127-18-4	6000/2000	120	720	NC	27	C	0.64	C	0.64	200	0.005	0.055	C	0.055
Thallium (and compounds) [6]	7440-28-0	10,000		80	NC	110	NC	10	NC	10		0.002	0.0072	NC	0.0072
Toluene	108-88-3	6000/2000	310	11,000	NC	2,200	NC	240	NC	240	530	1	20	NC	20
Toxaphene	8001-35-2	6000/2000		560	C	12	C	31	C	12	0.74	0.003	0.0026	C	0.003
1,2,4-Trichlorobenzene	120-82-1	6000/2000	1,100	8,900	NC	4,900	NC	77	NC	77	300	0.07	1	NC	1
1,1,1-Trichloroethane	71-55-6	6000/2000	640	34,000	NC	6,700	NC	280	NC	280	1,300	0.2	29	NC	29
1,1,2-Trichloroethane	79-00-5	6000/2000	1,300	600	NC	15	C	0.3	C	0.3	4,400	0.005	0.05	C	0.05
Trichloroethylene (TCE)	79-01-6	6000/2000	630	150	C	1.1	C	0.082	C	0.082	1,100	0.005	0.0072	C	0.0072
2,4,5-Trichlorophenol [6]	95-95-4	6000/2000		89,000	NC	49,000	NC	690	NC	690	1,200		10	NC	10
2,4,6-Trichlorophenol [6]	88-06-2	6000/2000		89	NC	49	NC	0.2	C	0.2	800		0.01	NC	0.01
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	6000/2000		8,900	NC	4,900	NC	6.1	NC	6.1	270		1	NC	1
1,2,4-Trimethylbenzene	95-63-6	6000/2000	430	920	NC	170	NC	780	NC	170	57		5.1	NC	5.1
1,3,5-Trimethylbenzene	108-67-8	6000/2000	90	380	NC	68	NC	190	NC	68	48		5.1	NC	5.1
Vinyl acetate	108-05-4	6000/2000	4,200	7,600	NC	1,400	NC	430	NC	430	20,000		100	NC	100
Vinyl chloride (chloroethene) [15]	75-01-4	6000/2000	930	250	C	3.1	C	0.013	C	0.013	2,800	0.002	0.0019	C	0.002
Xylene mixed (total)[2]	1330-20-7	6000/2000	170	4,800	NC	890	NC	430	NC	170	160	10	20	NC	20
Zinc [6]	7440-66-6	10,000		340,000	NC	470,000	NC	38,000	NC	10,000			31	NC	31

Table A Footnotes

1. Note each column in the closure level tables has a "c" or an "nc" next to the value. This designation indicates whether the numerical value is the result of calculation from a carcinogenic endpoint or a noncarcinogenic endpoint. Knowing the carcinogenic or noncarcinogenic designation is necessary when performing additivity. The user should be aware that there are many parameters used to calculate the closure levels, and a given compound may have closure levels that result from either carcinogenic or noncarcinogenic endpoints. Sometimes the endpoints may be different for different closure types. For instance, a direct soil value may have been generated from a carcinogenic endpoint, but the groundwater value may be from a noncarcinogenic endpoint. Most carcinogens are calculated using endpoints from both carcinogenic and noncarcinogenic toxicity information, and the system used to calculate the default closure level selects the lowest endpoint.

2. Certain chemicals that are considered liquids at soil temperatures have calculated soil saturation levels. The soil saturation level, or "Csat" value, is an indicator of the possibility there is free product present. In cases where the Csat value is lower than any other soil calculated value the Csat value becomes the default closure level. If the user does not think free product exists at the site but has concentrations that exceed Csat, but not other closure levels, then they should contact the IDEM site manager in order to verify there is no free product.

3. Residential soil direct contact values for arsenic and cadmium are based on the algorithms that measure the soil-plant-human uptake and not on the algorithms normally used to measure direct contact to surface soil.

4. Construction values are listed as the raw calculated values. When applying construction values to closures, the user should recognize that values for organic chemicals will be capped at the Soil Attenuation Capacity (SAC) value or the Csat, whichever is lower, or at 10,000 mg/kg for metals. Default SAC values are 6000 mg/kg for Direct Contact (surface soil) and 2000 mg/kg for Migration to Groundwater (subsurface soil). It is possible to raise the SAC value based on the organic carbon content in the soil, and the user is referred to the non-default chapter for further information.

Direct Contact and Migration to Groundwater closure levels are also listed as the raw calculated values. When applying these values separately, the user should recognize that these values will be capped at the SAC, the Csat or the Construction value, whichever is less. Other options exist to change the Direct Contact and Migration to Groundwater numbers, and the user is referred to the non-default chapter for further information.

5. Acrolein, Bis(2-chloroethyl)ether, and N-Nitroso-di-n-propylamine (as well as other compounds) may not have an analytical method available with a detection limit or quantitation limit that will meet the closure level. Appendix 2 should be consulted for suggested analytical procedures with detection limits that meet or approach meeting closure levels. If analytical methods capable of meeting closure levels for all site contaminants are not available, the IDEM site manager should be contacted to arrange for a conference with an IDEM chemist.
6. Koc and Kd values for ionizing organics and metals will vary depending on pH. If the

source area pH is outside the range of 6.0-8.0, then see the discussion in Section A1.0, under Table A, pages A.1-1 and A.1-2. Default closure levels have been calculated using Koc and Kd values at pH 6.8.

7. A "trihalomethane" is an organic compound consisting of a single carbon atom with three "halogen" atoms (bromine, chlorine, fluorine, or iodine) and a hydrogen atom attached. The National Primary Drinking Water Standards now include a "Total Trihalomethane standard" (TTHM MCL) of 0.08 mg/L. Under certain circumstances, i.e., when more than one trihalomethane compound is present on site, the "trihalomethane" standard will apply to bromoform, chloroform and bromodichloromethane. The composite standard may reduce the individual closure levels because the total concentration may not exceed the TTHM MCL.

8. Lead values were calculated using:

> The 1994 Integrated Exposure Uptake Biokinetic Model (see EPA/540/R-93/081, PB-963510),
>
> The Methodology for Assessing Risks Associated with Adult Exposure to Lead in Soil SRC-GLD-F0162-209-Draft-7/21/96,
>
> Review of the Methodology for Establishing Risk-Based Remediation Goals for Commercial Areas of the California Gultch Site, USEPA, Technical Review Workgroup for Lead, October 26, 1995 for industrial and construction exposures, and
>
> The Drinking Water Regulation and Health Advisories EPA 822-R-96-001, February, 1996 action levels for residential groundwater and an extrapolation to determine industrial groundwater levels.

The Kd value for lead was taken from Sheppard and Thibault (*Default Soil Solid Liquid Partition Coefficients, Kds for Four Major Soil Types: A Compendium*, Health Physics Vol 59, No 4, pp 471-482, 1990) for sandy soils and is considered to be applicable anywhere in the state.

9. Closure levels for Beryllium and Mercury must be determined with a site specific pH. Please see the discussion in section A.1.0 under Table A, pages A.1-1 and A.1-2.

10. Chloroform no longer has an Oral Slope Factor; the Oral RfD at 0.01 mg/kg-day is considered to be protective of the carcinogenic endpoint from the oral route.

11. PCBs are assumed to be a mixture and that Arochlors 1016 and 1254 are present.

12. Total Chromium concentrations must be assumed to be 100% Chromium VI unless a species-specific ratio evaluation of Chromium VI to Chromium III is made. The Inhalation Slope Factor used for Chromium VI is from USEPA Region 09 and is based on a review of the available studies and literature.

13. Cyanide values apply to "free" cyanide only. The closure levels are not applicable to copper

cyanide and other complexed cyanides. The physical constants used in the calculation of the free cyanide closure levels are based on hydrogen cyanide (non-complexed, ionic cyanide). Total cyanide concentrations may not be representative of, and in fact may over estimate, free cyanide concentrations.

14. Certain compounds have very low solubilities, and the groundwater closure values are defaulted to their respective solubility limits. Concentrations in excess of the solubility limit can be an indicator of the presence of free product. When the solubility limit has been exceeded and the user believes that free product does not exist, then the user should contact the project manager to determine a course of action to verify there is no free product.

15. Vinyl Chloride calculations are based on a child-only slope factor. This may not be applicable at sites where there are only adults. In such a case, the user should contact the IDEM project manager to determine if an alternate closure level is applicable.

16. Residential Groundwater value from EPA Drinking Water and Health Advisories, EPA 822-R-02-038, USEPA, Office of Water, Summer 2002.

TABLE B

Chemical/Physical Properties

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
Acenaphthene	83-32-9	0.0421	0.00000769	7,080		0.00636	0.13	4.24		95	279	154
Acenaphthylene	208-96-8	0.0439	0.00000753	6,120		0.0595	0.13	3.93		92.5	280	152.2
Acetone (2-Propanone)	67-64-1	0.124	0.0000114	0.575		0.00159	0.1	1,000,000		-95.4	56.2	58.1
Acrolein	107-02-8	0.11	0.000012	21		0.00125	0.1	206,000		-86.9	53	56.1
Aldrin	309-00-2	0.0132	0.00000486	2,450,000		0.00697	0.1	0.18		104	145	364.9
Anthracene	120-12-7	0.0324	0.00000774	29,500		0.00267	0.13	0.0434		218	340	178
Antimony and compounds	7440-36-0				45	0	0.01	0	0.006	630	1,750	121.8
Arsenic	7440-38-2				29	0	0.03	0	0.05	817	613	74.9
Barium	7440-39-3				41	0	0.01	0	2	725	1,640	137
Benzene	71-43-2	0.088	0.0000098	58.9		0.228	0.1	1,750	0.005	5.5	80.1	78.1
Benzo(a)anthracene	56-55-3	0.051	0.000009	398,000		0.000137	0.13	0.0094		159	435	228.3
Benzo(a)pyrene	50-32-8	0.043	0.000009	1,020,000		0.0000463	0.13	0.00162	0.0002	179	443	252.3
Benzo(b)fluoranthene	205-99-2	0.0226	0.00000556	1,230,000		0.00455	0.13	0.0015		168	443	252.3
Benzo(g,h,i)perylene	191-24-2	0.046	0.0000052	1,580,000		0.0000059	0.13	0.00026		273	550	276.34
Benzo(k)fluoranthene	207-08-9	0.0226	0.00000556	1,230,000		0.000034	0.13	0.0008		216	480	252.3
Benzoic acid	65-85-0	0.0536	0.00000797	0.576		0.0000631	0.1	3,500		122	249	122
Benzyl Alcohol	100-51-6	0.0689	0.00000938	10.2		0.0000155	0.1	40,000		-15.2	205	108.1
Beryllium and compunds	7440-41-7				790	0	0.01	0	0.004	1,290	2,970	9.01
Bis(2-chloro-1-methylethyl) ether	108-60-1	0.063	0.0000064	61		0.0046	0.1	1,700		-97	187	171

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
Bis(2-Chloroethyl)ether	111-44-4	0.0692	0.00000753	15.5		0.000738	0.1	17,200		-24.5	178	143.01
Bis(2-chloroisopropyl)ether	39638-32-9	0.063	0.0000064	61		0.0046	0.1	1,700		-34.8	125	171
Bis(2-ethylhexyl)phthalate	117-81-7	0.0351	0.00000366	15,100,000		0.00000418	0.1	0.34	0.006	-47	384	390.6
Bromodichloromethane	75-27-4	0.0298	0.0000106	55		0.0656	0.1	6,740	0.08	-57.1	90	163.8
Bromoform(tribromomethane)	75-25-2	0.0149	0.0000103	87.1		0.0219	0.1	3,100	0.08	8	149	252.8
n-Butanol	71-36-3	0.08	0.0000093	6.92		0.000361	0.1	74,000		-89.8	118	74.1
Butylbenzylphthalate	85-68-7	0.0174	0.00000483	57,500		0.0000517	0.1	2.69		-35	370	312.4
Cadmium	7440-43-9				75	0	0.001	0	0.005	321	765	112.4
Carbazole	86-74-8	0.039	0.00000703	3,390		0.000000626	0.1	7.48		246.2	355	167.2
Carbon disulfide	75-15-0	0.104	0.00001	45.7		1.24	0.1	1,190		-112	46.5	76.1
Carbon tetrachloride	56-23-5	0.078	0.0000088	174		1.25	0.1	793	0.005	-23	76.5	153.9
Chlordane	12789-03-6	0.0118	0.00000437	120,000		0.00199	0.04	0.056	0.002	106	175	409.8
p-Chloroaniline	106-47-8	0.0483	0.0000101	66.1		0.0000136	0.1	5,300		72.5	232	128
Chlorobenzene	108-90-7	0.073	0.0000087	219		0.152	0.1	472	0.1	-45.6	132	112.6
Chloroethane	75-00-3	0.1	0.000012	143		0.455	0.1	5,740		-139	12.3	64.5
Chloroform	67-66-3	0.104	0.00001	39.8		0.15	0.1	7,920	0.08	-63.6	61.5	119.4
2-Chloronapthalene	91-58-7	0.035	0.0000088	1,600		0.013	0.1	12		61	256	163
2-Chlorophenol	95-57-8	0.0501	0.00000946	388		0.016	0.1	22,000		9.3	175	129
Chromium III	16065-83-1				1,800,000		0.01		0.1	1,900	2,642	52

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
Chromium VI	18540-29-9				19	0	0.01	0	0.1	1,900	2,642	52
Chrysene	218-01-9	0.0248	0.00000621	398,000		0.00388	0.13	0.0016		256	448	228.3
Copper	7440-50-8				35		0.01		1.3	1,083	2,595	79.5
Cyanide, Free	57-12-5	0.18	0.000018	17		0.0053	0.01	1,000,000	0.2	-13.4	25.7	26
Cyclohexane	110-82-7	0.08	0.000009	160		8.2	0.1	55		6.59	80.7	84.2
DDD	72-54-8	0.0169	0.00000476	1,000,000		0.000164	0.03	0.09		109.5	193	320
DDE	72-55-9	0.0144	0.00000587	4,470,000		0.000861	0.03	0.12		89	316	518
DDT	50-29-3	0.0137	0.00000495	2,630,000		0.000332	0.03	0.025		108.5	260	354.5
Dibenzo(a,h)anthracene	53-70-3	0.0202	0.00000518	3,800,000		0.000000603	0.13	0.00249		278	524	278.4
Dibenzofuran	132-64-9	0.06	0.00001	7,800		0.00053	0.1	3.1		86.5	287	168
1,2-Dichlorobenzene	95-50-1	0.069	0.0000079	617		0.0779	0.1	156	0.6	-16.7	181	147
1,3-Dichlorobenzene	541-73-1	0.069	0.0000079	620		0.078	0.1	160		-24.8	173	147
1,4-Dichlorobenzene	106-46-7	0.069	0.0000079	617		0.0996	0.1	73.8	0.075	52.7	174	147
3,3-Dichlorobenzidine	91-94-1	0.0194	0.00000674	724		0.000000164	0.1	3.11		132.5	368	253.1
1,1-Dichloroethane	75-34-3	0.0742	0.0000105	31.6		0.23	0.1	5,060		-96.9	57.3	99
1,2-Dichloroethane	107-06-2	0.104	0.0000099	17.4		0.0401	0.1	8,520	0.005	-35.5	83.5	99
1,1-Dichloroethylene	75-35-4	0.09	0.0000104	58.9		1.07	0.1	2,250	0.007	-123	31.7	97
cis-1,2-Dichloroethylene	156-59-2	0.0736	0.0000113	35.5		0.167	0.1	3,500	0.07	-80	60	97
trans-1,2-Dichloroethylene	156-60-5	0.0707	0.0000119	52.5		0.385	0.1	6,300	0.1	-49.8	49	97

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
2,4-Dichlorophenol	120-83-2	0.0346	0.00000877	147		0.00013	0.1	4,500		45	210	163
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	0.0231	0.00000731	26.2		0.00000041	0.05	680	0.07	141	160	221
1,2-Dichloropropane	78-87-5	0.0782	0.00000873	43.7		0.115	0.1	2,800	0.005	-70	96.4	111
1,3-Dichloropropene	542-75-6	0.0626	0.00001	45.7		0.726	0.1	2,800		-60	108	110
Dieldrin	60-57-1	0.0125	0.00000474	21,400		0.000619	0.1	0.195		175.5	385	380.9
Diethylphthalate	84-66-2	0.0256	0.00000635	288		0.0000185	0.1	1,080		-40.5	295	222.3
2,4-Dimethylphenol	105-67-9	0.0584	0.00000869	209		0.000082	0.1	7,870		24.5	211	122.2
Dimethylphthalate	131-11-3	0.0568	0.00000629	37.1		0.00000429	0.1	4,000		5.5	284	194
Di-n-butyl phthalate	84-74-2	0.0438	0.00000786	33,900		3.85E-08	0.1	11.2		-35	340	278.3
2,4-Dinitrophenol	51-28-5	0.0273	0.00000906	0.0102		0.0000182	0.1	2,790		116	>200	184
Dinitrotoluene mixture	25321-14-6	0.118	0.00000716	82.4		0.0000172	0.1	226		68.5	293	182
Di-n-octyl phthalate	117-84-0	0.0151	0.00000358	83,200,000		0.00274	0.1	0.02		-30	220	390
Endosulfan	115-29-7	0.0115	0.00000455	2,140		0.000459	0.1	0.51		106	>200	406.9
Endrin	72-20-8	0.0125	0.00000474	12,300		0.000308	0.1	0.25	0.002	200	245	380.9
Ethylbenzene	100-41-4	0.075	0.0000078	363		0.323	0.1	169	0.7	-94.9	137	106.2
Fluoranthene	206-44-0	0.0302	0.00000635	107,000		0.00066	0.13	0.206		108	384	202.4
Fluorene	86-73-7	0.0363	0.00000788	13,800		0.00261	0.13	1.98		117	295	166.2
alpha-HCH(alpha-BHC)	319-84-6	0.0142	0.00000734	1,230		0.000435	0.04	2		160	288	290.8
beta-HCH(beta-BHC)	319-85-7	0.0142	0.00000734	1,260		0.0000305	0.04	0.24		315	600	290.8

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
gamma-HCH(Lindane)	58-89-9	0.0142	0.00000734	1,070		0.000574	0.04	6.8	0.0002	112.5	323	290.4
Heptachlor	76-44-8	0.0112	0.00000569	1,410,000		0.0447	0.1	0.18	0.0004	95.5	135	373.4
Heptachlor epoxide	1024-57-3	0.0132	0.00000423	83,200		0.00039	0.1	0.2	0.0002	160	200	389.3
Hexachloro-1,3-butadiene	87-68-3	0.0561	0.00000616	53,700		0.334	0.1	3.23		-21	215	260.8
Hexachlorobenzene	118-74-1	0.0542	0.00000591	55,000		0.0541	0.1	6.2	0.001	231.8	325	284.8
Hexachlorocyclopentadiene	77-47-4	0.0161	0.00000721	200,000		1.11	0.1	1.8	0.05	-9	239	272.8
Hexachloroethane	67-72-1	0.0025	0.0000068	1,780		0.159	0.1	50		187	189	236.7
n-Hexane	110-54-3	0.2	0.0000078	2,260		69.3	0.1	9.5		-95	69	86.2
Indeno(1,2,3-cd)pyrene	193-39-5	0.019	0.00000566	3,470,000		0.0000656	0.13	0.000022		164	530	276
Iodomethane	74-88-4	0.073	0.000012	18.6		0.22	0.1	13,900		-66	42	142
Isophorone	78-59-1	0.0623	0.00000676	46.8		0.000272	0.1	12,000		-8.1	215	138.2
Lead	7439-92-1				270		0.01		0.015	327	1,740	207
Mercury and compounds	7439-97-6				52		0.01	69,000	0.002	277	302	272
Methoxychlor	72-43-5	0.0156	0.00000446	97,700		0.000648	0.1	0.045	0.04	87	346	345.7
Methyl bromide (bromomethane)	74-83-9	0.0728	0.0000121	10.5		0.256	0.1	15,200		-93.7	3.56	95
Methyl ethyl ketone (MEK)	78-93-3	0.09	0.0000098	3.55		0.00237	0.1	136,000		-86.3	79.6	72.1
Methyl tertiary butyl ether (MTBE)	1634-04–4	0.08	0.00001	11.2		0.0241	0.1	48,000		-109	55.2	88.2
4-Methyl-2-pentanone (MIBK)	108-10-1	0.075	0.0000078	130		0.0057	0.1	19,000		-84	117	100
Methylene chloride	75-09-2	0.101	0.0000117	11.7		0.0898	0.1	13,000	0.005	-95.1	39.8	84.9

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP ^oC	BP ^oC	MW g/mol
2-Methylnaphthalene	91-57-6	0.048	0.00000784	2,454		0.0205	0.13	24.6		34.6	241	142.2
3-Methylphenol (m-cresol)	108-39-4	0.074	0.00001	34.7		0.0000355	0.1	22,700		12.2	202	108
4-Methylphenol (p-cresol)	106-44-5	0.074	0.00001	49		0.0000325	0.1	21,500		34.7	202	108.1
2-Methylphenol(o-cresol)	95-48-7	0.074	0.0000083	91.2		0.0000492	0.1	26,000		30.9	191	108.1
Naphthalene	91-20-3	0.059	0.0000075	2,000		0.0198	0.13	31		80.5	218	128.2
Nickel, soluble salts	various				65	0	0.01	0		1,455	2,730	58.7
2-Nitroaniline	88-74-4	0.0473	0.00000858	52.7		0.00000241	0.1	1,470		71.2	284	138.1
Nitrobenzene	98-95-3	0.076	0.0000086	64.6		0.000984	0.1	2,090		5.7	211	123.1
N-Nitrosodi-n-propylamine	621-64-7	0.0545	0.00000817	24		0.0000923	0.1	9,890		6.6	206	130.19
N-Nitrosodiphenylamine	86-30-6	0.0312	0.00000635	1,290		0.000205	0.1	35.1		66.5	359	198.23
PCBs (polychorinated biphenyls)	1336-36-3	0.08	0.000008	309,000		0.106	0.14	0.7	0.0005	>24	>200	268.4
Pentachlorophenol	87-86-5	0.056	0.0000061	592		0.000001	0.25	1,950	0.001	174	310	266.4
Phenanthrene	85-01-8	0.0324	0.00000774	14,125		0.00105	0.13	1.2		100	340	178.2
Phenol	108-95-2	0.082	0.0000091	28.8		0.0000163	0.1	82,800		40.9	182	94.1
Pyrene	129-00-0	0.0272	0.00000724	105,000		0.000451	0.13	0.135		156	404	202.3
Selenium	7782-49-2				5	0	0.01	0	0.05	217	684	79
Silver	7440-22-4				8.3	0	0.01	0		962	2,212	107.9
Styrene	100-42-5	0.071	0.000008	776		0.113	0.1	310	0.1	-30.6	145	104.2
1,1,1,2-Tetrachloroethane	630-20-6	0.071	0.0000079	93.3		0.0141	0.1	2,970		-70.2	131	167.9

Contaminant	CAS	Di,a cm^2/s	Di,w cm^2/s	Koc l/kg	K_D (Inorganic) l/kg	H' unitless	ABS unitless	S mg/l	MCL mg/l	MP °C	BP °C	MW g/mol
1,1,2,2-Tetrachloroethane	79-34-5	0.071	0.0000079	93.3		0.0141	0.1	2,970		-43.8	147	167.9
Tetrachloroethylene (PCE)	127-18-4	0.072	0.0000082	155		0.754	0.1	200	0.005	-22.3	121	165.8
Thallium (and compounds)	7440-28-0				71	0	0.01	0	0.002	303.5	1,457	204.4
Toluene	108-88-3	0.087	0.0000086	182		0.272	0.1	526	1	-94.9	111	92.1
Toxaphene	8001-35-2	0.0116	0.00000434	257,000		0.000246	0.1	0.74	0.003	78	NA	181.4
1,2,4-Trichlorobenzene	120-82-1	0.03	0.00000823	1,780		0.0582	0.1	300	0.07	17	213	181.4
1,1,1-Trichloroethane	71-55-6	0.078	0.0000088	110		0.705	0.1	1,330	0.2	-30.4	74.1	133.4
1,1,2-Trichloroethane	79-00-5	0.078	0.0000088	50.1		0.0374	0.1	4,420	0.005	-36.6	114	133.4
Trichloroethylene (TCE)	79-01-6	0.079	0.0000091	166		0.422	0.1	1,100	0.005	-84.7	86.7	131.4
2,4,5-Trichlorophenol	95-95-4	0.0291	0.00000703	1,600		0.000178	0.1	1,200		69	253	197.5
2,4,6-Trichlorophenol	88-06-2	0.0318	0.00000625	381		0.000319	0.1	800		69	247	197.5
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	0.0192	0.0000067	48.6		0.000000356	0.1	268		154	>200	256
1,2,4-Trimethylbenzene	95-63-6	0.075	0.00000071	3,700		0.23	0.1	57		-43.8	169	120
1,3,5-Trimethylbenzene	108-67-8	0.075	0.00000071	820		0.32	0.1	48		-44.7	165	120
Vinyl acetate	108-05-4	0.085	0.0000092	5.25		0.021	0.1	20,000		-93.2	72.7	86.1
Vinyl chloride (chloroethene)	75-01-4	0.106	0.00000123	18.6		1.11	0.1	2,760	0.002	-154	-13	62.5
Xylene mixed (total)	1330-20-7	0.07	0.0000078	407		0.301	0.1	161	10	-37	141	106.2
Zinc	7440-66-6				62	0	0.01	0		419.5	908	65.4

Above parameters are listed for 25° C and 760 mm Hg.
Footnotes

1. Cyanide as CN- is assumed to be non-volatile as it is in pH 6.8 soil and nonacidic water.

Key of terms
Di,a-diffusivity in air
Di,w-diffusivity in water
Koc-soil organic carbon-water partitioning coefficient
Kd-soil-water partition coefficient
H'-Dimensionless Henry's Law constant (a measure of the affinity of a compound to volatilize from water)
ABS-fraction absorbed through skin
S-water solubility
MCL-Safe Drinking Water Act maximum contaminat level
MP-melting point
BP- boiling point
MW- molecular weight

Table C

Exposure Equations

Equation Number	Equation Name	Table C - Exposure Equations
A1-1	Residential Groundwater (Carcinogens)	$C_{gwrc} = \frac{TR \times BW_a \times AT_c \times 365\ {}^{day}/_{year}}{EF_r \times ED_r \times \left[\left(SF_o \times IngR_{raw}\right) + \left(SF_i \times InhR_{raa} \times K\right)\right]}$
A1-2	Residential Groundwater (Non-carcinogens)	$C_{gwrn} = \frac{THQ \times BW_a \times AT_n \times 365\ {}^{days}/_{year}}{EF_r \times ED_r \left[\left(\frac{IngR_{raw}}{RFD_o}\right) + \left(\frac{InhR_{raa}}{RFD_i} \times K\right)\right]}$
A1-3	Residential Soil Direct Contact (Carcinogens)	$C_{ssrc} = \frac{TR \times AT_c \times 365\ {}^{days}/_{year}}{EF_r \left[\frac{SF_o\left(IngF_{adj} + \left(SFS_{adj} \times ABS\right)\right)}{10^6\ {}^{mg}/_{kg}} + InhF_{adj} \times SF_i\left(\frac{1}{VF} + \frac{1}{PEF}\right)\right]}$
A 1-4	Residential Direct Contact (Non-carcinogens)	$C_{ssrn} = \frac{THQ \times AT_n \times 365\ {}^{days}/_{year}}{EF_r \left[\left(\frac{IngF_{adj} + \left(SFS_{adj} \times ABS\right)}{RFD_o \times 10^6\ {}^{mg}/_{kg}}\right) + \frac{InhF_{adj}}{RFD_i}\left(\frac{1}{VF} + \frac{1}{PEF}\right)\right]}$
A 1-5	Residential Soil Migration to GW (Carcinogens)	$C_{sbsrc} = C_{gwrc} \times 20\left[K_d + \frac{\theta_{w\rho} + \left(\theta_{a\rho} \times H'\right)}{\rho_b}\right]$

Equation Number	Equation Name	Table C - Exposure Equations
A 1-6	Residential Soil Migration to GW (Non-carcinogens)	$C_{sbsrn} = C_{gwrn} \times 20\left[K_d + \frac{\theta_{w\rho} + (\theta_{a\rho} \times H')}{\rho_b}\right]$
A 1-7	Commercial / Industrial Groundwater (Carcinogens)	$C_{gwic} = \frac{TR \times BW_a \times AT_c \times 365\ {}^{days}/_{year}}{EF_i \times ED_i \times (SF_o \times IngR_{iaw})}$
A 1-8	Commercial/ Industrial Groundwater (Non-carcinogens)	$C_{gwin} = \frac{THQ \times BW_a \times AT_n \times 365\ {}^{days}/_{year}}{EF_i \times ED_i\left(\frac{IngR_{iaw}}{RFD_o}\right)}$
A 1-9	Commercial/Industrial Soil Direct Contact (Carcinogens)	$C_{ssic} = \frac{TR \times BW_a \times AT_c \times 365\ {}^{days}/_{year}}{EF_i \times ED_i\left[SF_o \times \left(\frac{IngR_{ias} + (SA_{ias} \times M \times ABS)}{10^6 mg/kg}\right) + SF_i \times InhR_{iaa}\left(\frac{1}{VF} + \frac{1}{PEF}\right)\right]}$
A1-10	Commercial/ Industrial Soil Direct Contact (Non-carcinogens)	$C_{ssin} = \frac{THQ \times BW_a \times AT_n \times 365\ {}^{days}/_{year}}{EF_i \times ED_i\left[\frac{(IngR_{ias} + (SA_{ias} \times M \times ABS))}{RFD_o(10^6\ {}^{mg}/_{kg})} + \frac{InhR_{iaa}}{RFD_i}\left(\frac{1}{VF} + \frac{1}{PEF}\right)\right]}$

Equation Number	Equation Name	Table C - Exposure Equations
A1-11	Commercial/ Industrial Soil Migration to GW (Carcinogens)	$C_{sbsic} = C_{gwic} \times 20\left[K_d + \frac{\theta_{w\rho} + (\theta_{a\rho} \times H')}{\rho_b}\right]$
A 1-12	Commercial/Industrial Migration to GW Contact (Non-carcinogens)	$C_{sbsin} = C_{gwin} \times 20\left[K_d + \frac{\theta_{w\rho} + (\theta_{a\rho} \times H')}{\rho_b}\right]$
A 1-13	Construction Soils (Carcinogens)	$C_{sscc} = \frac{TR \times BW_a \times AT_c \times 365\ {}^{days}/_{year}}{EF_{co} \times ED_{co}\left[SF_o \times \frac{(IngR_{cas} + (SA_{cas} \times M \times ABS))}{10^6\ {}^{mg}/_{kg}} + SF_i \times InhR_{caa}\left[\frac{1}{VF} + \frac{1}{PEF}\right]\right]}$
A 1-14	Construction Soils (Non-carcinogens)	$C_{sscn} = \frac{THQ \times BW_a \times AT_n \times 365\ {}^{days}/_{year}}{ED_{co} \times EF_{co}\left[\frac{(IngR_{cas} + (SA_{cas} \times M \times ABS))}{RFD_o\left(10^6\ {}^{mg}/_{kg}\right)} + \frac{InhR_{caa}}{RFD_i}\left[\frac{1}{VF} + \frac{1}{PEF}\right]\right]}$

Equation Number	Equation Name	Table C - Exposure Equations
A 1-15	Volatilization Factor	$$VF = \frac{\frac{Q}{C_{vf}} \times (3.14 \times D_a \times T)^{\frac{1}{2}} \times 10^{-4}\ {}^{m^2}/_{cm^2}}{(2 \times \rho_b \times D_a)}$$ Where: $$D_a = \frac{\left[\frac{\left(\theta_{avf}{}^{10/3} D_i H' + \theta_{wvf}{}^{10/3} D_w\right)}{n^2}\right]}{\rho_b K_d + \theta_{wvf} + \theta_{avf} H'}$$
A 1-16	Particulate Emission Factor Equation	$$PEF = {}^{Q}/_{C_\rho} \times \left[\frac{3{,}600\ s/h}{0.036 \times (1 - V) \times \left(\frac{U_m}{U_t}\right)^3 \times F(x)}\right]$$
A 1-17	Ingestion Soil - Age Adjusted	$$IngF_{adj}\ \frac{mg\text{-}yr}{Kg\text{-}day} = \frac{ED_{ch} \times IngR_{rcs}}{BW_c} + \frac{(ED_r - ED_{ch}) \times IngR_{ras}}{BW_a}$$
A 1-18	Skin Contact - Age Adjusted	$$SFS_{adj}\ \frac{mg\text{-}yr}{Kg\text{-}day} = \frac{ED_{ch} \times M \times SA_{rcs}}{BW_c} + \frac{(ED_r - ED_{ch}) \times M \times SA_{ras}}{BW_a}$$

Equation Number	Equation Name	Table C - Exposure Equations
A 1-19	Inhalation - Age Adjusted	$\mathrm{InhF_{adj}}\ \frac{\mathrm{M^3\text{-}yr}}{\mathrm{Kg\text{-}day}} = \frac{\mathrm{ED_{ch}} \times \mathrm{InhR_{rca}}}{\mathrm{BW_c}} + \frac{(\mathrm{ED_r} - \mathrm{ED_{ch}}) \times \mathrm{InhR_{raa}}}{\mathrm{BW_a}}$
7-1	Soil to Groundwater Partitioning Model	$\mathrm{CCL} = \mathrm{C_w} \times DAF \times \left[K_\mathrm{d} + \frac{\theta_\mathrm{w} + \theta_\mathrm{a} H'}{\rho_\mathrm{b}} \right]$
7-3	Soil Saturation Limit Equation	$C_\mathrm{sat} = \frac{S}{\rho_\mathrm{b}} \left(K_\mathrm{d} \rho_\mathrm{b} + \theta_\mathrm{w} + H' \theta_\mathrm{a} \right)$
7-4	Soil Attenuation Capacity	Site Specific Soil Attenuation Capacity = f_{oc} X 10^6

TABLE D

Equation Parameters/Exposure Assumptions

Symbol	Parameter	Value
2_{ap}	Air Filled Soil Porosity Partitioning model	0.134 l air/l soil
2_{avf}	Air Filled Soil Porosity - volatilization	0.284 l air /l soil
2_{wp}	Water Filled Soil Porosity Partitioning model	0.3 l water/l soil
2_{wvf}	Water Filled Soil Porosity - volatilization	0.15 l water /l soil
ABS	Skin Absorbance Factor (Absorbed fraction)	Chemical Specific (unitless see Table B)
AT_c AT_n	Averaging Time (subscript dictates chemical type)	C = 70 Years carcinogens N = 30 Years residential non-carcinogens 25 years industrial noncarcinogens 1 year construction noncarcinogens
BW_a	Body Weight Adult	70 kg
BW_c	Body Weight Child	15 kg
C	Carcinogen	Chemical Specific
CCL	Carcinogen Closure Level	Chemical Specific
C_{gwrc}	Default Level Groundwater Concentration for Residential Carcinogen	Chemical Specific (mg/l)
C_{gwrn}	Default Level Groundwater Concentration for Residential Non-carcinogen	Chemical Specific (mg/l)
C_{igwc}	Default Level Commercial/Industrial Groundwater Concentration for Carcinogen	Chemical Specific mg/l
C_{igwn}	Default Level Commercial/Industrial Groundwater Concentration for Non-carcinogen	Chemical Specific mg/l
C_{sat}	Soil Saturation Limit	Chemical Specific (mg/kg)
C_{sbrsc}	Subsurface Soil Residential Carcinogen	Chemical Specific (mg/kg)
C_{sbrsn}	Subsurface Soil Residential Non-carcinogen	Chemical Specific (mg/kg)
C_{sbsic}	Default Closure Level Subsurface Soil Commercial/Industrial Carcinogen	Chemical Specific (mg/kg)

Symbol	Parameter	Value
C_{sbsin}	Default Closure Level Subsurface Soil Commercial/Industrial Non-carcinogen	Chemical Specific (mg/kg)
C_{scc}	Default Closure Level Soil Concentration Construction Carcinogenic	Chemical specific (mg/kg)
C_{scn}	Default Closure Level Soil Concentration Construction Non-carcinogenic	Chemical specific (mg/kg)
C_{ssic}	Default Closure Level Surface Soil Commercial/Industrial Carcinogen	Chemical Specific (mg/kg)
C_{ssin}	Default Closure Level Surface Soil Commercial/Industrial Non-carcinogen	Chemical Specific (mg/kg)
C_{ssrc}	Default Closure Level Residential Surface Soil Concentration Carcinogenic (direct contact)	Chemical specific (mg/kg)
C_{ssrn}	Default Closure Level Residential Surface Soil Concentration Non-carcinogenic (direct contact)	Chemical specific (mg/kg)
D_a	Apparent Diffusivity	Chemical Specific cm^2/s
D_i	Diffusivity in Air	Chemical Specific cm^2/s
D_w	Diffusivity in Water	Chemical Specific cm^2/s
ED_{ch}	Exposure Duration Child	6 years
ED_{co}	Exposure Duration Construction	1 year
ED_i	Exposure Duration Commercial/Industrial	25 years
ED_r	Exposure Duration Residential	30 years
EF_{co}	Exposure Frequency Construction	45 days
EF_i	Exposure Frequency Commercial/Industrial	250 days/yr
EF_r	Exposure Frequency Residential	350 days/year
EF_{rs}	Exposure Frequency Residential Soil	250 days/year
F(x)	Function dependent on U_m/U_t	0.194 (unitless)
f_{oc}	Fraction Soil Organic Carbon (Fraction)	0.002 for subsurface soil 0.006 for surface soil

Symbol	Parameter	Value
H'	Henry's Law Constant x 41	Chemical Specific (unitless)
$IngF_{adj}$	Ingestion Factor Soil Age Adjusted	114 mg-yr/kg-day
$IngR_{cas}$	Ingestion Rate Construction Adult Soil	480 mg/day
$IngR_{ias}$	Ingestion Rate Commercial/Industrial Adult Soil	50 mg/day
$IngR_{iaw}$	Ingestion Rate Commercial/Industrial Adult Water	1.0 l/day
$IngR_{ras}$	Ingestion Rate Residential Adult Soil	100 mg/day
$IngR_{raw}$	Ingestion Rate Residential Adult Water	2.0 1/day
$IngR_{rcs}$	Ingestion Rate Residential Child Soil	200 mg/day
$InhF_{adj}$	Inhalation Factor Age Adjusted	10.9 m^3-yr/kg-day
$InhR_{caa}$	Inhalation Rate Construction Adult Air	20 m^3/day
$InhR_{iaa}$	Inhalation Rate Commercial/Industrial Adult Air	20 m^3/day
$InhR_{raa}$	Inhalation Rate Residential Adult Air	15 m^3/day Indoor 20 m^3/day Outdoor
$InhR_{rca}$	Inhalation Rate Residential Child Air	10 m^3/day
K	Indoor Volatilization Factor (Inhalation from volatiles in groundwater)	0.5 (unitless)
K_d	Soil/Water Partition Coefficient(See Table B) K_d = Table Values for Metals(See Table B) $K_d = K_{oc} \times f_{oc}$ for Organics(See Table B)	Chemical Specific (l/kg) Chemical Specific (l/kg) Chemical Specific (l/kg)
K_{oc}	Soil Organic Carbon/Water Partition Coefficient(See Table B)	Chemical Specific (l/kg)
l	Length of sampling interval	site specific
M	Soil to Skin Adherence Factor	0.5 mg/cm^2-day
n	Number of site samples	Chemical Specific
NC	Non-carcinogen	Chemical Specific
NCL	Non-carcinogen Closure Level	Chemical Specific

Symbol	Parameter	Value
P_b	Dry Soil Bulk Density	1.5 kg/l
PEF	Particulate Emission Factor (See Table C)	1.316×10^9 m^3/kg
P_s	Soil particle density	2.65 g/cm^3
Q/C_{vf}	Inverse of the mean concentration at the center of a 0.5 acre source - volatilization factor	$\frac{68.81\ g/m^2\text{-}s}{kg/m^3}$
Q/C_p	Inverse of the mean concentration at the center of a 0.5 acre source - particulates	$\frac{90.80\ g/m^2\text{-}Sec}{kg/m^3}$
RFD_i	Reference Dose Inhalation	Chemical Specific (mg/Kg - day)
RFD_o	Reference Dose Oral	Chemical Specific (mg/Kg - day)
s	Standard deviation of site sample set	Chemical Specific
S	Solubility in Water	Chemical Specific (mg/l-water)
SA_{cas}	Surface Area Construction Exposed Adult Skin	3160 cm^2
SA_{ias}	Surface Area Commercial/Industrial Exposed Adult Skin	3160 cm^2
SA_{ras}	Surface Area Residential Exposed Adult Skin	5000 cm^2
SA_{rcs}	Surface Area Residential Exposed Child Skin	2000 cm^2
SF_i	Carcinogenic Potency Slope Inhalation	Chemical Specific $(mg/Kg - day)^{-1}$
SF_o	Carcinogenic Potency Slope Oral	Chemical Specific $(mg/Kg - day)^{-1}$
SFS_{adj}	Skin Factor Soil Age Adjusted (See Table C)	1257 mg-yr/kg-day
t	Students' t value corresponding to n at the 95% confidence level (one tailed test)	Chemical Specific
T	Exposure interval Volatilization Equation	9.5×10^8 s
THQ	Target Hazard Quotient	1 (unitless)
TR	Target Risk	1×10^{-5} (unitless)
U_m	Mean annual wind speed	4.69 m/s
U_t	Equivalent threshold value of wind speed at 7 m	11.32 m/s
V	Fraction of vegetative cover	0.5 (unitless, = 50%)

Symbol	Parameter	Value
VF	Volatilization Factor (See Table C)	Chemical Specific m^3/kg
$\bar{x}$	Average of site samples	Chemical Specific

TABLE E

Default Exposure Assumption References

Table E DEFAULT EXPOSURE ASSUMPTION REFERENCES		
PARAMETER	**VALUE**	**REFERENCE**
Target Risk	10^{-5} (unitless)	IDEM draft policy
Target Hazard Quotient	1.0	IDEM draft policy
Target Hazard Index	1.0	IDEM draft policy
Cancer Slope Factor	Chemical Specific Oral or Inhalation $(mg/kg\text{-}day)^{-1}$	IRIS, HEAST, NCEA, Regions 3, 6, 9
Reference Dose Oral or Inhalation	Chemical Specific (mg/kg-day)	IRIS, HEAST, NCEA, Regions 3, 6, 9
Body Weight Adult	70kg	RAGS (Part A) EPA 1989 EPA/540/1-89/002
Averaging Time	Carcinogen-70 yrs Noncarcinogen-Exposure Duration	RAGS (Part A) EPA 1989 EPA/540/1-89/002
Skin Surface Area Adult	5000 cm^2(25%)	Exposure Factors, EPA 1989 OSWER No. 9285.6-03
Skin Surface Area Child	2000 cm^2(25%)	Dermal Assessment, EPA 1992 EPA/600/8-91/011B
Skin Surface Area Adult Construction in Industrial	3160 cm^2	Dermal Assessment 1992, Construction , (heads, hands, forearms)
Adherence Factor	0.5 mg/cm^{-5}-day	Dermal Assessment, EPA 1992
Skin Absorption	0.1 most organics 0.01 most metals (Select compounds have other values)	EPA, Cal-EPA-(DTSC, 1994)
Inhalation Rate Adult Residential Indoor Inhalation Rate Adult Residential Outdoor	15 m^3/day 20 m^3/ day	RAGS Part B OSHWER No. 9285.6-03

Table E DEFAULT EXPOSURE ASSUMPTION REFERENCES		
PARAMETER	**VALUE**	**REFERENCE**
Inhalation Rate Adult Occupational	20 m^3/day	RAGS Part B OSHWER No. 9285.6-03
Inhalation Rate Child	10 m^3/day	EPA Region 6, 9 (Referencing RAGS Part A, EPA/540/1-89/002)
Drinking Water Ingestion Adult	2.0 1/day	RAGS Part A
Drinking Water Ingestion Child	1.0 1/day	PEA, Cal-EPA (DTSC, 1994)
Drinking Water Ingestion Occupational	1.0 1/day	IDEM VRP (OER, October 1995)
Soil Ingestion Adult	100 mg/day	OSHWER No. 9285.6-03 RAGS 1989
Soil Ingestion Child	200 mg/day	OSHWER No. 9285.6-03 RAGS 1989
Soil Ingestion Adult Occupational	50 mg/day	OSHWER No. 9285.6-03
Soil Ingestion Adult Construction	480 mg/day	OSWER Directive: 9285.6-03 Attachment B
Exposure Frequency Residential	350 days/yr	OSHWER No. 9285.6-03
Exposure Frequency Occupational	250 days/yr	OSHWER No. 9285.6-03
Exposure Frequency Construction	45 days/yr	IDEM Policy Region V RCRA Correspondence 9/30/96
Exposure Frequency Residential soil	250 days	IDEM Policy EPA 1984, EPA/600/8-84/031
Exposure Duration Residential	30 years	OSWER Directive: 9285.6-03
Exposure Duration Occupational	25 years	OSWER Directive: 9285.6-03

Table E DEFAULT EXPOSURE ASSUMPTION REFERENCES		
PARAMETER	**VALUE**	**REFERENCE**
Exposure Duration Construction	1 year	IDEM Policy Region V RCRA Correspondence 9/30/96
Indoor Volatilization Factor	0.5	RAGS Part B
Particulate Emission Factor Model	1.32×10^9 m^3/kg	EPA 1996, EPA 540/R-96/18 Defaults as listed in same
Volatilization Factor Outdoor Soil Model	Chemical Specific m^3/kg	EPA 1996, EPA 540/R-96/18 Defaults as listed in same
Soil Partition to Groundwater Model	Chemical Specific mg/kg	EPA 1996, EPA 540/R-96/18 Defaults as listed in same
Soil Saturation Limit	Chemical Specific mg/kg	EPA 1996, EPA 540/R-96/18 Defaults as listed in same
Age Adjusted Factors		
Ingestion soils	114 mg-yr/kg-day	RAGS Part B
Skin Contact	1257 mg-yr/kg-day	RAGS Part B by analogy
Inhalation	10.9 m^3 -yr/kg-day	RAGS Part B by analogy

TABLE F

Human Health Toxicity Parameters

		Chronic Sfo (mg/kg-day)$^{-1}$		Chronic Rfdo mg/kg-day		Chronic SFi (mg/kg-day)$^{-1}$		Chronic RfDi mg/kg-day		Sub-Chronic RfDo mg/kg-day		Sub-Chronic RfDi mg/kg-day	
Chemical	**CAS**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**
Acenaphthene	83-32-9			0.06	I			0.06	6,9 (R)				
Acenaphthylene	208-96-8			0.0071	S			0.01	S				
Acetone (2-Propanone)	67-64-1			0.9	I			0.1	6,9 (R)				
Acrolein	107-02-8			0.0005	I			0.0000057	I				
Aldrin	309-00-2	17	I	0.00003	I	17	I	0.00003	6,9 (R)	0.00003	H	0.00003	H
Anthracene	120-12-7			0.3	I			0.3	6,9 (R)	3	H		
Antimony and compounds	7440-36-0			0.0004	I								
Arsenic	7440-38-2	1.5	I	0.0003	I	15	I			0.0003	H		
Barium	7440-39-3			0.07	I			0.000143	H				
Benzene	71-43-2	0.055	I	0.004	I	0.029	3,9	0.0086	I				
Benzo(a)anthracene	56-55-3	0.73	3,6,9 (N)			0.31	6(N)						
Benzo(a)pyrene	50-32-8	7.3	I			3.1	3,6 (N), N						
Benzo(b)fluoranthene	205-99-2	0.73	3,6,9 (N)			0.31	6(N)						
Benzo(g,h,i)perylene	191-24-2	0.073	IDEM			0.031	IDEM						
Benzo(k)fluoranthene	207-08-9	0.073	3,6,9 (N)			0.031	6(N)						
Benzoic acid	65-85-0			4	I			4	9(R)				
Benzyl Alcohol	100-51-6			0.3	H			0.3	6,9 (R)				
Beryllium and compunds	7440-41-7			0.002	I	8.4	I	0.0000057	I				
Bis(2-chloro-1-methylethyl) ether	108-60-1	0.07	9	0.04	9(I)	0.035	9	0.04	9(R)				
Bis(2-Chloroethyl)ether	111-44-4	1.1	I			1.2	I						
Bis(2-chloroisopropyl)ether	39638-32-9	0.07	9	0.04	9(I)	0.035	9	0.04	9(R)	0.04	H	0.04	R
Bis(2-ethylhexyl)phthalate	117-81-7	0.014	I	0.02	I	0.014	3(N) 6,9 (R)	0.022	6,9 (R)				
Bromodichloromethane	75-27-4	0.062	I	0.02	I	0.062	6,9 (R)	0.02	6,9 (R)				
Bromoform(tribromomethane)	75-25-2	0.0079	I	0.02	I	0.0039	I	0.02	6,9 (R)				
n-Butanol	71-36-3			0.1	I			0.0026	9(N)				
Butylbenzylphthalate	85-68-7			0.2	I			0.2	6,9 (R)				
Cadmium	7440-43-9			0.0005	I	6.3	I	0.000057	6,3 (N)				
Carbazole	86-74-8	0.02	H			0.02	6,9 (R)						
Carbon disulfide	75-15-0			0.1	I			0.2	I				
Carbon tetrachloride	56-23-5	0.13	I	0.0007	I	0.053	I	0.00057	3(N)				
Chlordane	12789-03-6	0.35	I	0.0005	I	0.35	I	0.0002	I				
p-Chloroaniline	106-47-8			0.004	I			0.004	6,9 (R)				
Chlorobenzene	108-90-7			0.02	I			0.017	3,6,9 (N)				
Chloroethane	75-00-3	0.0029	3,6,9 (N)	0.4	3,6,9 (N)	0.0029	6,9 (R)	2.9	I				
Chloroform	67-66-3		I	0.01	I	0.081	I	0.000086	6 (N)				
2-Chloronapthalene	91-58-7			0.08	I			0.08	6,9 (R)				
2-Chlorophenol	95-57-8			0.005	I			0.005	6,9 (R)	0.05	H	0.05	R
Chromium III	16065-83-1			1.5	I								

		Chronic Sfo (mg/kg-day)$^{-1}$		Chronic Rfdo mg/kg-day		Chronic SFi (mg/kg-day)$^{-1}$		Chronic RfDi mg/kg-day		Sub-Chronic RfDo mg/kg-day		Sub-Chronic RfDi mg/kg-day	
Chemical	**CAS**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**
Chromium VI	18540-29-9			0.003	I		290	9I	0.000029	I			
Chrysene	218-01-9	0.0073	3,6,9 (N)			0.0031	6(N)						
Copper	7440-50-8			0.037	6								
Cyanide, Free	57-12-5			0.02	I								
Cyclohexane	110-82-7			1.7	R				1.7	I			
DDD	72-54-8	0.24	I			0.24	6,9 (R)						
DDE	72-55-9	0.34	I			0.34	6,9 (R)						
DDT	50-29-3	0.34	I	0.0005	I	0.34	I	0.0005	6,9 R				
Dibenzo(a,h)anthracene	53-70-3	7.3	3,6,9 (N)			3.1	6(N)						
Dibenzofuran	132-64-9			0.002	3 (N)			0.002	R				
1,2-Dichlorobenzene	95-50-1			0.09	I			0.057	H				
1,3-Dichlorobenzene	541-73-1			0.0009	9(N), N			0.0009	9(N), N				
1,4-Dichlorobenzene	106-46-7	0.024	H	0.03	3,6,9(N)	0.022	3,9 N	0.23	I				
3,3-Dichlorobenzidine	91-94-1	0.45	I			0.45	6,9 (R)						
1,1-Dichloroethane	75-34-3			0.1	H			0.14	H				
1,2-Dichloroethane	107-06-2	0.091	I	0.03	3,9 N	0.091	I	0.0014	3,9 N				
1,1-Dichloroethylene	75-35-4			0.05	I			0.057	I				
cis-1,2-Dichloroethylene	156-59-2			0.01	3,6,9 H			0.01	6,9 (R)				
trans-1,2-Dichloroethylene	156-60-5			0.02	I			0.02	6,9 (R)				
2,4-Dichlorophenol	120-83-2			0.003	I			0.003	6,9 (R)				
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7			0.01	I			0.01	6,9(R)				
1,2-Dichloropropane	78-87-5	0.068	H	0.0011	6,9 (R)	0.068	6,9 (R)	0.0011	I				
1,3-Dichloropropene	542-75-6	0.1	I	0.03	I	0.014	I	0.0057	I	0.003	H	0.0057	
Dieldrin	60-57-1	16	I	0.00005	I	16	I	0.00005	6,9 (R)				
Diethylphthalate	84-66-2			0.8	I			0.8	6,9 (R)				
2,4-Dimethylphenol	105-67-9			0.02	I			0.02	6,9 (R)				
Dimethylphthalate	131-11-3			10	3,6,9 (H)			10	6,9 (R)				
Di-n-butyl phthalate	84-74-2			0.1	I			0.1	6,9 (R)				
2,4-Dinitrophenol	51-28-5			0.002	I			0.002	6,9 (R)				
Dinitrotoluene mixture	25321-14-6	0.68	I	0.001	H	0.68	6,9 (R)	0.001	R				
Di-n-octyl phthalate	117-84-0			0.02	H			0.02	6 (R)				
Endosulfan	115-29-7			0.006	I			0.006	6,9 (R)				
Endrin	72-20-8			0.0003	I			0.0003	6,9 (R)				
Ethylbenzene	100-41-4			0.1	I			0.29	I				
Fluoranthene	206-44-0			0.04	I			0.04	6,9 (R)				
Fluorene	86-73-7			0.04	I			0.04	6,9 (R)				
alpha-HCH(alpha-BHC)	319-84-6	6.3	I			6.3	I						
beta-HCH(beta-BHC)	319-85-7	1.8	I			1.9	I						

		Chronic Sfo (mg/kg-day)$^{-1}$		Chronic Rfdo mg/kg-day		Chronic SFi (mg/kg-day)$^{-1}$		Chronic RfDi mg/kg-day		Sub-Chronic RfDo mg/kg-day		Sub-Chronic RfDi mg/kg-day	
Chemical	**CAS**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**
gamma-HCH(Lindane)	58-89-9	1.3	H	0.0003	I	1.3	6,9 (R)	0.0003	6,9 (R)				
Heptachlor	76-44-8	4.5	I	0.0005	I	4.6	I	0.0005	6,9 (R)				
Heptachlor epoxide	1024-57-3	9.1	I	0.000013	I	9.1	I	0.000013	6,9 (R)				
Hexachloro-1,3-butadiene	87-68-3	0.078	I	0.0002	H	0.077	I	0.0002	6,9 (R)				
Hexachlorobenzene	118-74-1	1.6	I	0.0008	I	1.6	I	0.0008	6,9 (R)				
Hexachlorocyclopentadiene	77-47-4			0.006	I			0.000057	I	0.0002	H	0.07	H
Hexachloroethane	67-72-1	0.014	I	0.001	I	0.014	I	0.001	6,9 (R)				
n-Hexane	110-54-3			0.06	H			0.057	I				
Indeno(1,2,3-cd)pyrene	193-39-5	0.73	3,6,9 N			0.31	6(N)						
Iodomethane	74-88-4	1	IDEM	0.00421	IDEM								
Isophorone	78-59-1	0.00095	I	0.2	I	0.00095	6,9 (R)	0.2	6,9 (R)				
Lead	7439-92-1												
Mercury and compounds	7439-97-6			0.0003	I			0.000086	I	0.0004	H		
Methoxychlor	72-43-5			0.005	I			0.005	6,9 (R)				
Methyl bromide (bromomethane)	74-83-9			0.0014	I			0.0014	I				
Methyl ethyl ketone (MEK)	78-93-3			0.6	I			1.4	I				
Methyl tertiary butyl ether (MTBE)	1634-04–4	0.0033	9(N)	0.86	9(R)	0.00035	9(N)	0.86	I				
4-Methyl-2-pentanone (MIBK)	108-10-1			0.08	3,6,9 H			0.86	I				
Methylene chloride	75-09-2	0.0075	I	0.06	I	0.0016	I	0.86	H				
2-Methylnaphthalene	91-57-6			0.02	3(N)			0.02	R				
3-Methylphenol (m-cresol)	108-39-4			0.05	I			0.05	6,9 (R)				
4-Methylphenol (p-cresol)	106-44-5			0.005	H			0.005	6,9 (R)				
2-Methylphenol(o-cresol)	95-48-7			0.05	I			0.05	6,9 (R)				
Naphthalene	91-20-3			0.02	I			0.00086	I				
Nickel, soluble salts	various			0.02	I	0.84	I						
2-Nitroaniline	88-74-4			0.000057	6(R)			0.000057	H				
Nitrobenzene	98-95-3			0.0005	I			0.00057	H				
N-Nitrosodi-n-propylamine	621-64-7	7	I			7	6,9 (R)						
N-Nitrosodiphenylamine	86-30-6	0.0049	I			0.0049	6,9 (R)						
PCBs (polychorinated biphenyls)	1336-36-3	2	I	0.00002	I	2	I	0.00002	R				
Pentachlorophenol	87-86-5	0.12	I	0.03	I	0.12	6,9 (R)	0.03	6,9 (R)				
Phenanthrene	85-01-8			0.003	IDEM			0.003	IDEM				
Phenol	108-95-2			0.3	I			0.3	R				
Pyrene	129-00-0			0.03	I			0.03	6,9 (R)				
Selenium	7782-49-2			0.005	I								
Silver	7440-22-4			0.005	I								
Styrene	100-42-5			0.2	I			0.29	I				
1,1,1,2-Tetrachloroethane	630-20-6	0.026	I	0.03	I	0.026	I	0.03	6,9 (R)				

		Chronic Sfo (mg/kg-day)$^{-1}$		Chronic Rfdo mg/kg-day		Chronic SFi (mg/kg-day)$^{-1}$		Chronic RfDi mg/kg-day		Sub-Chronic RfDo mg/kg-day		Sub-Chronic RfDi mg/kg-day	
Chemical	**CAS**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**	**Value**	**Source**
1,1,2,2-Tetrachloroethane	79-34-5	0.2	I	0.06	3,6,9(N)	0.2	I	0.06	6,9 (R)				
Tetrachloroethylene (PCE)	127-18-4	0.052	6,9(N)	0.01	I	0.012	6 (N)	0.011	6 (N)				
Thallium (and compounds)	7440-28-0			0.00007	IDEM								
Toluene	108-88-3			0.2	I			0.11	I				
Toxaphene	8001-35-2	1.1	I			1.1	I						
1,2,4-Trichlorobenzene	120-82-1			0.01	I			0.057	H	0.01	H	0.57	H
1,1,1-Trichloroethane	71-55-6			0.28	3,9 (N)			0.63	3,9(N)				
1,1,2-Trichloroethane	79-00-5	0.057	I	0.004	I	0.056	I	0.004	6,9 (R)				
Trichloroethylene (TCE)	79-01-6	0.4	3,6,9 (N)	0.0003	3,6,9 (N)	0.4	3,6,9 (N)	0.01	3,9(N)				
2,4,5-Trichlorophenol	95-95-4			0.1	I			0.1	6,9 (R)				
2,4,6-Trichlorophenol	88-06-2	0.011	I	0.0001	9 (N)	0.011	I	0.0001	9(R)				
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5			0.01	I			0.01	6,9(R)				
1,2,4-Trimethylbenzene	95-63-6			0.05	3,6,9(N)			0.0017	3,6,9(N)				
1,3,5-Trimethylbenzene	108-67-8			0.05	3,6,9(N)			0.0017	3,6,9(N)				
Vinyl acetate	108-05-4			1	H			0.057	I	1	H	0.057	H
Vinyl chloride (chloroethene)	75-01-4	1.5	I	0.003	I	0.031	I	0.029	I				
Xylene mixed (total)	1330-20-7			0.2	I			0.029	I				
Zinc	7440-66-6			0.3	I								

SFi = Inhalation Slope Factor
SFo = Oral Slope Factor
RfDi = Inhalation Reference Dose
RfDo = Oral Reference Dose
3,6,9 = EPA Regions 3,6,9 Screening Tables

CAS = Chemical Abstract Service
H = Heast
I = IRIS
N = NCEA
R = Route to Route Extrapolation

PCB Slope Factor and RfD assume a mixture of PCB congeners including Aroclor 1016 and 1254.

Table G

Critical Effects

TABLE G
CRITICAL EFFECTS

Chemical	CAS No.	Critical Effects Category / Primary Critical Effect	Exposure Pathway(s) Affected	Source
Acenaphthene	83-32-9	Systemic (Liver)	Oral, *[Inhalation(R)]*	IRIS
Acenaphthylene	208-96-8	Systemic (Liver)	Oral, *[Inhalation(R)]*	Similar PAHs (ATSDR 1995)
Acetone	67-64-1	Systemic (Kidney, liver)	Oral	IRIS
		Neurological (Nonspecific)	Inhalation	IRIS
Acrolein	107-02-8	Systemic (Nonspecific)	Oral	IRIS
		Respiratory (Nasal passageway, lungs)	Inhalation	IRIS
Anthracene	120-12-7	Systemic (Liver)	Oral, *[Inhalation(R)]*	ATSDR
Antimony	7440-36-0	Circulatory (Heart, blood) Systemic (Nonspecific)	Oral	IRIS
Barium	7440-39-3	Systemic (Kidney)	Oral	IRIS
		Reproductive/Developmental (Nonspecific)	Inhalation	HEAST
Benzoic acid	65-85-0	Systemic (Nonspecific)	Oral, *[Inhalation(R)]*	IRIS
Benzyl alcohol	100-51-6	Gastrointestinal (Stomach)	Oral, *[Inhalation(R)]*	HEAST
Beryllium	7440-41-7	Gastrointestinal (Intestines)	Oral	IRIS
n-Butanol	71-36-3	Neurological (Central nervous system)	Oral	IRIS
		Neurological (Central nervous system), Systemic (Liver), Circulatory (Blood)	Inhalation	NCEA
Butylbenzylphthalate	85-68-7	Systemic (Liver)	Oral, *[Inhalation(R)]*	IRIS
Cadmium	7440-43-9	Systemic (Kidney)	Oral	IRIS
Carbon disulfide	75-15-0	Developmental (Teratology, nonspecific)	Oral	IRIS
		Neurological (Peripheral nervous system)	Inhalation	IRIS

Chemical	CAS No.	Critical Effects Category / Primary Critical Effect	Exposure Pathway(s) Affected	Source
4-Chloroaniline	106-47-8	Musculoskeletal (Connective tissue)	Oral, *[Inhalation(R)]*	IRIS
Chlorobenzene	108-90-7	Systemic (Liver)	Oral	IRIS
		Systemic (Liver)	Inhalation	NCEA
Chloroethane (Ethyl Chloride)	75-00-3	Developmental (Growth Retardation)	Inhalation	IRIS
Chloroform	67-66-3	Systemic (Liver)	Oral	IRIS
		Systemic (Liver, kidney)	Inhalation	NCEA
2-Chloronapthalene	91-58-7	Systemic (Liver)	Oral, *[Inhalation(R)]*	IRIS
2-Chlorophenol	95-57-8	Reproductive (Nonspecific)	Oral, *[Inhalation(R)]*	IRIS
Chromium III	16065-83-1	Respiratory (Lung)	Oral	ATSDR
Chromium VI	18540-29-9	Respiratory (Nasal passageway, lung)	Inhalation	IRIS
Copper	7440-50-8	Gastrointestinal (Stomach)	Oral	ATSDR
Cyanide (free)	57-12-5	Endocrine (Thyroid), Neurological (Neurons)	Oral	IRIS
Cyclohexane	110-82-7	Developmental (Nonspecific)	Inhalation, *[Oral (R)]*	IRIS
Dibenzofuran	132-64-9	Systemic (Kidney)	Oral, *[Inhalation(R)]*	NCEA
Di-n-butyl phthalate	84-74-2	Developmental (Teratology)	Oral, *[Inhalation(R)]*	IRIS
1,2-Dichlorobenzene	95-50-1	Systemic (Liver)	Oral	IRIS
		Systemic (Nonspecific)	Inhalation	HEAST
1,3-Dichlorobenzene	541-73-1	Systemic (Liver)	Oral	NCEA
1,1-Dichloroethane	75-34-3	Systemic (Kidney)	Inhalation, *[Oral (R)]*	HEAST
		Neurological (Central nervous system)	Inhalation	ATSDR
cis-1,2-Dichloroethene	156-59-2	Circulatory (Blood)	Oral, *[Inhalation(R)]*	HEAST
trans-1,2-Dichloroethene	156-60-5	Circulatory (Blood)	Oral, *[Inhalation(R)]*	IRIS

Chemical	CAS No.	Critical Effects Category / Primary Critical Effect	Exposure Pathway(s) Affected	Source
2,4-Dichlorophenol	120-83-2	Immunological (Lymph)	Oral, *[Inhalation(R)]*	IRIS
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	Systemic (Liver, kidney), Circulatory (Blood)	Oral, *[Inhalation(R)]*	IRIS
Diethyl phthalate	84-66-2	Developmental (Growth retardation)	Oral, *[Inhalation(R)]*	IRIS
2,4-Dimethylphenol	105-67-9	Neurological (Central nervous system), Circulatory (Blood)	Oral, *[Inhalation(R)]*	IRIS
Dimethyl phthalate	131-11-3	Systemic (Kidney, liver)	Inhalation *[Oral(R)]*	HSDB
2,4-Dinitrophenol	51-28-5	Dermal/Ocular (eye)	Oral, *[Inhalation(R)]*	IRIS
Di-n-octyl phthalate	117-84-0	Systemic (Liver, kidney)	Oral, *[Inhalation(R)]*	HEAST
Endosulfan	115-29-7	Systemic (Kidney), Circulatory (Blood vessel)	Oral, *[Inhalation(R)]*	IRIS
Endrin	72-20-8	Systemic (Liver)	Oral, *[Inhalation(R)]*	IRIS
Ethylbenzene	100-41-4	Systemic (Liver, kidney)	Oral	IRIS
		Developmental (Teratology)	Inhalation	IRIS
Fluoranthene	206-44-0	Systemic (Liver, kidney), Circulatory (Blood)	Oral, *[Inhalation(R)]*	IRIS
Fluorene	86-73-7	Circulatory (Blood)	Oral, *[Inhalation(R)]*	IRIS
n-Hexane	110-54-3	Neurological (Nonspecific)	Oral	HEAST
		Neurological (Nonspecific)	Inhalation	IRIS
Hexachlorocyclopentadiene	77-47-4	Gastrointestinal (Stomach)	Oral	IRIS
		Respiratory (Nasal passageway)	Inhalation	IRIS
Lead	7439-92-1	Neurological (Central nervous system)	Oral, Inhalation	ATSDR
Mercury and compounds	7487-94-7	Systemic (Kidney), Immunological (Autoimmune effects)	Oral	IRIS
Mercury, elemental	7439-97-6	Neurological (Central nervous system)	Inhalation	IRIS

Chemical	CAS No.	Critical Effects Category / Primary Critical Effect	Exposure Pathway(s) Affected	Source
Methoxychlor	72-43-5	Developmental (Nonspecific), Reproductive (Nonspecific)	Oral, *[Inhalation(R)]*	IRIS
Methyl bromide (Bromomethane)	74-83-9	Gastrointestinal (Stomach)	Oral	IRIS
		Respiratory (Nasal cavity)	Inhalation	IRIS
Methyl ethyl ketone (n-Butanone, MEK)	78-93-3	Developmental (Nonspecific)	Oral	IRIS
		Developmental (Structural malformations)	Inhalation	IRIS
4-Methyl-2-pentanone (Methyl isobutyl ketone, MIBK)	108-10-1	Systemic (Liver, Kidney)	Oral	HEAST
		Developmental (Nonspecific)	Inhalation	IRIS
2-Methylnaphthalene	91-57-6	Respiratory (Lungs, nasal passageways)	Oral	IRIS
		Respiratory (Nasal cavity and passageways)	Inhalation	ATSDR *(09/2003 Draft)*
2-Methylphenol (o-Cresol)	95-48-7	Neurological (Central nervous system)	Oral, *[Inhalation(R)]*	IRIS
3-Methylphenol (m-Cresol)	108-39-4	Neurological (Central nervous system)	Oral, *[Inhalation(R)]*	IRIS
4-Methylphenol (p-Cresol)	106-44-5	Neurological (Central nervous system)	Oral, *[Inhalation(R)]*	HEAST
Naphthalene	91-20-3	Systemic (Nonspecific)	Oral	IRIS
		Respiratory (Nasal)	Inhalation	IRIS
Nickel, soluble salts	various	Circulatory (Heart), Systemic (Liver), Immunological (Spleen)	Oral	IRIS
2-Nitroaniline	88-74-4	Circulatory (Blood)	Inhalation *[Oral(R)]*	HEAST
Nitrobenzene	98-95-3	Systemic (Liver, kidney), Endocrine (Adrenals), Circulatory (Blood)	Oral	IRIS
			Inhalation	HEAST
Phenanthrene	85-01-8	Systemic (Liver)	Oral, *[Inhalation(R)]*	Similar PAHs (ATSDR 1995)
Phenol	108-95-2	Developmental (Nonspecific)	Oral	IRIS
Pyrene	129-00-0	Systemic (Kidney)	Oral, *[Inhalation(R)]*	IRIS

Chemical	CAS No.	Critical Effects Category / Primary Critical Effect	Exposure Pathway(s) Affected	Source
Selenium	7782-49-2	Dermal/Ocular (Skin), Neurological (Central nervous system)	Oral	IRIS
Silver	7440-22-4	Dermal/Ocular (Skin)	Oral	IRIS
Styrene	100-42-5	Circulatory(Blood), Systemic (Liver)	Oral	IRIS
		Neurological (Central nervous system)	Inhalation	IRIS
Thallium and compounds	7440-28-0	Systemic (Liver),	Oral	IRIS
Toluene	108-88-3	Systemic (Liver, Kidney)	Oral	IRIS
		Neurological (Central nervous system)	Inhalation	IRIS
1,2,4-Trichlorobenzene	120-82-1	Endocrine (Adrenal)	Oral	IRIS
		Systemic (Liver)	Inhalation	HEAST
1,1,1-Trichloroethane	71-55-6	Systemic (Liver), Neurological (Central nervous system)	Oral	NCEA
			Inhalation	NCEA
2,4,5-Trichlorophenol	95-95-4	Systemic (Liver, kidney)	Oral, *[Inhalation(R)]*	IRIS
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	93-76-5	Systemic (Urinary tract) Developmental (Nonspecific)	Oral, *[Inhalation(R)]*	IRIS
1,2,4-Trimethylbenzene	95-63-6	Systemic (Nonspecific)	Oral	NCEA
		Neurological (Central nervous system)	Inhalation	NCEA
1,3,5-Trimethylbenzene	108-67-8	Systemic (Systemic Nonspecific)	Oral	NCEA
		Neurological (Central nervous system)	Inhalation	NCEA
Vinyl acetate	108-05-4	Systemic (Kidney)	Oral	HEAST
		Respiratory (Nasal)	Inhalation	IRIS
Xylenes (mixed isomers)	1330-20-7	Systemic (Nonspecific)	Oral	IRIS
		Neurological (Central nervous system)	Inhalation	IRIS
Zinc	7440-66-6	Circulatory (Blood)	Oral	IRIS

[Pathway(R)] indicates that the reference dose (RfD) for the pathway in brackets was based on a route-to-route extrapolation from the RfD for a pathway that has been more thoroughly studied. The critical effects and target organs are assumed to be the same for the extrapolated pathway as for the studied pathway.

Critical Effects Categories and Target Organs

1. Systemic: Liver, kidney, urinary tract
2. Circulatory: Arteries, veins, heart, and blood
3. Gastrointestinal: Buccal cavity, esophagus, stomach, intestines, and gall bladder
4. Musculoskeletal: Muscles, bone, and connective tissues
5. Respiratory: Lungs, trachea, and nasal passageway
6. Immunological: Lymph and tissue fluid, spleen, and lymph nodes
7. Neurological: Brain, spinal cord, neurons, and neuroglia
8. Reproductive/Endocrine: Testes, ovaries, thyroid, adrenal, pituitary, pancreas, and parathyroid
9. Developmental: Teratology, growth retardation, structural malformations, and abnormal development
10. Dermal/ Ocular: Skin and eyes

The primary critical effect and target organ for each chemical was obtained using the following sources (in order of preference):

1. IRIS (EPA 2000)
2. HEAST (EPA 1997)
3. ATSDR Toxicological Profiles
4. NCEA Issue Papers (EPA 1993 – 2003)
5. Hazardous Substance Databank (http://toxnet.nlm.nih.gov)

Exceptions include the following critical effects and target organs:

- Some compounds have a RfD based on the No Observed Adverse Effects Level (NOAEL), and information on toxic effects at higher doses was not available. In these cases, the critical effect of a surrogate compound (similar in structure and type) was used.
- Some compounds have a RfD established with the NOAEL and some toxic effects information. The toxic effects information was used to establish the critical effect.
- Some compounds have experimentally derived oral and inhalation reference doses. Critical effects from both routes have been listed. These compounds should be considered as additive in both categories (if both exposure pathways have receptors).
- Some compounds did not have an easily identified target organ within the critical effects category. These compounds were classified within a category as “nonspecific.”

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EPA, 2002	Supplemental Guidance for Developing Soil Screening Levels For Superfund Sites, OSWER 9355.4-24
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EPA, CAL-EPA-(DSTC, 1994)	California EPA, 1994. Preliminary Endangerment Assessment Manual (PEA), Department of Toxic Substances Control, Sacramento California.
	Exposure Factors EPA, 1989 Exposure Factors Handbook, EPA/600/8-89/043
HEAST	Health Effects Assessment Summary Tables, FY 97 Update EPA-54–R-97-036
HSDB	Hazardous Substances Data Bank. (See NLM.)
IDEM, VRP	Voluntary Remediation Program, Resource Guide, OER, IDEM October 1995.
IRIS	Integrated Risk Information System, EPA http://www.epa.gov/iris
NCEA	National Center for Exposure Assessment, http://www.epa.gov/ncea
NLM	National Library of Medicine (NLM) Toxicology Information Network (TOXNET), 2003: Hazardous Substances Databank (HSDB): http://toxnet.nlm.nih.gov/

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