

Tables

TABLE 3-1
CHEMICALS OF CONCERN FOR DIFFERENT PRODUCT RELEASES

Chemical Name	PRODUCT RELEASED					
	Gasoline	Diesel	Jet Fuel	Kerosene	Fuel Oil #2	Used Oil*
Benzene	X	X	X	X	X	X
1,2 Dichloroethane (DCA)	X	-	-	-	-	-
Ethylbenzene	X	X	X	X	X	X
Ethylene dibromide (EDB)	X	-	-	-	-	-
Methyl Tertbutyl Ether (MtBE)	X	-	-	-	-	-
Naphthalene	X	X	X	X	X	X
Toluene	X	X	X	X	X	X
Xylenes (mixed)	X	X	X	X	X	X

Footnotes:

X - Chemical of Concern

"-" - not a chemical of concern

* - for used oil releases as determined through a TPH analysis, TCLP analysis for metals, semi-volatiles and volatiles must be performed to determine the chemicals of concern.

TABLE 3-2
CHEMICAL-SPECIFIC TOXICITY PARAMETERS

CHEMICAL NAME	SLOPE FACTOR			REFERENCE DOSE		
	ORAL [l/(mg/kg-day)]	INHALATION [l/(mg/kg-day)]	DERMAL [l/(mg/kg-day)]	ORAL [mg/kg-day]	INHALATION [mg/kg-day]	DERMAL [mg/kg-day]
Benzene	0.055	0.0273	0.055	0.004	0.00857	0.004
1,2 Dichloroethane (DCA)	0.091	0.091	0.091	0.02	0.686	0.02
Ethylbenzene	0.011	0.00875	0.011	0.1	0.286	0.1
Ethylene dibromide (EDB)	85	0.77	85	0.000057	0.000057	0.000057
Methyl tertbutyl-Ether (MtBE)	0.018	0.00091	0.018	0.857	0.857	0.857
Naphthalene	0.119	0.119	0.119	0.02	0.000857	0.02
Toluene	NA	NA	NA	0.08	1.43	0.08
Xylenes (mixed)	NA	NA	NA	0.2	0.0286	0.2

Note: For dermal exposure, oral toxicity values were used.
NA: = Not Available

TABLE 3-3
CHEMICAL-SPECIFIC FATE & TRANSPORT PARAMETERS

CHEMICAL	Koc [cm ³ /g]	Kd [cm ³ /g]	H' [cc-H ₂ O/cc-air]	S [mg/l]	Dair [cm ² /s]	Dwater [cm ² /s]
Benzene	146	1.46	0.23	1790	0.09	0.00001
1,2 Dichloroethane (DCA)	39.6	0.396	0.048	8600	0.086	0.000011
Ethylbenzene	446	4.46	0.32	169	0.068	0.0000085
Ethylene dibromide (EDB)	39.6	0.396	0.027	3910	0.043	0.00000518
Methyl tertbutyl Ether (MtBE)	11.6	0.116	0.024	51000	0.075	0.0000086
Naphthalene	1540	15.4	0.018	31	0.06	0.0000084
Toluene	234	2.34	0.27	526	0.078	0.0000092
Xylenes (mixed)	383	3.83	0.21	106	0.085	0.0000099

Definition of Symbols

Koc : Organic carbon partition coefficient

Kd : Soil-water partition coefficient

H : Normalized Henry's Law constant

Note: Kd = Koc x foc (from Fate and Transport Input Table)

S: Solubility

Dair: Diffusion coefficient in air

Dwater: Diffusion coefficient in water

**TABLE 3-4
TIER 2 & 3A DEFAULT EXPOSURE PARAMETERS**

PARAMETER	SYMBOL	UNITS	VALUE*
Averaging Time			
Carcinogens	AT _c	year	70
Non-Carcinogens	AT _n	year	=ED
Body Weight			
On/Off-site Resident (adult)	BW	kg	70
On/Off-site Resident (child)	BW	kg	15
On/Off-site Commercial Workers	BW	kg	70
Construction Worker	BW	kg	70
Exposure Duration			
On/Off-site Resident (adult)	ED	year	30
On/Off-site Resident (child)	ED	year	6
On/Off-site Commercial Workers	ED	year	25
Construction Worker	ED	year	1
Exposure Frequency			
On/Off-site Resident (adult and child)	EF	days/yr	350
On/Off-site Commercial Workers	EF	days/yr	250
Construction Worker	EF	days/yr	90
Indoor Exposure Time			
On/Off-site Resident (adult)	ET _{in}	hrs/day	12
On/Off-site Resident (child)	ET _{in}	hrs/day	12
On/Off-site Commercial Workers	ET _{in}	hrs/day	8
Construction Worker	ET _{in}	hrs/day	8
Outdoor Exposure Time			
On/Off-site Resident (adult)	ET _{out}	hrs/day	8
On/Off-site Resident (child)	ET _{out}	hrs/day	8
On/Off-site Commercial Workers	ET _{out}	hrs/day	8
Construction Worker	ET _{out}	hrs/day	10
Soil Ingestion Rate			
On/Off-site Resident (adult)	IR _{soil}	mg/day	100
On/Off-site Resident (child)	IR _{soil}	mg/day	200
On/Off-site Commercial Workers	IR _{soil}	mg/day	50
Construction Worker	IR _{soil}	mg/day	480
Ground Water Ingestion Rate			
On/Off-site Resident (adult)	IR _w	L/day	2
On/Off-site Resident (child)	IR _w	L/day	1
On/Off-site Commercial Workers	IR _w	L/day	2
Hourly Outdoor Inhalation Rate			
On/Off-site Resident (adult)	IR _{ao}	m ³ /hr	2.5
On/Off-site Resident (child)	IR _{ao}	m ³ /hr	1.25
On/Off-site Commercial Workers	IR _{ao}	m ³ /hr	2.5
Construction Worker	IR _{ao}	m ³ /hr	2.5
Hourly Indoor Inhalation Rate			
On/Off-site Resident (adult)	IR _{ai}	m ³ /hr	1.67
On/Off-site Resident (child)	IR _{ai}	m ³ /hr	0.84
On/Off-site Commercial Workers	IR _{ai}	m ³ /hr	2.5
Skin Surface Area			
On/Off-site Resident (adult)	SA _{Child}	cm ² /day	5000
On/Off-site Resident (child)	SA _{Adult}	cm ² /day	1750
On/Off-site Commercial Workers	SA _{Comm}	cm ² /day	5000
Construction Worker	SA _{Const}	cm ² /day	7250
Soil to Skin Adherence Factor			
On/Off-site Resident (adult)	M	mg/cm ²	0.2
On/Off-site Resident (child)	M	mg/cm ²	0.2
On/Off-site Commercial Workers	M	mg/cm ²	0.2
Construction Worker	M	mg/cm ²	0.2
Target Risk	TR	***	1E-05
Target Hazard quotient	THQ	***	1

* Exposure Factors Handbook, Volume 1. August 1997. U.S. EPA, Office of Research and Development, Washington DC 20460. EPA/600/P-95/002

TABLE 3-5
TIER 2 & 3A DEFAULT FATE AND TRANSPORT PARAMETERS

PARAMETER	SYMBOL	UNIT	VALUE
SOIL PARAMETERS			
Soil Source Length	W	cm	1500
Depth to Subsurface Soil	L _s	cm	30.48
Thickness of Surficial Soil	d	cm	30.48
Thickness of Capillary Fringe	h _{cap}	cm	5
Thickness of Vadose Zone	h _v	cm	295
Dry Soil Bulk Density	ρ _s	g/cm ³	1.5
Fractional Organic Carbon Content	f _{oc}	g-C/g-soil	0.01
Total Soil Porosity	θ _T	cm ³ /cm ³ -soil	0.43
Volumetric Water Content in Capillary Fringe	θ _{wcap}	cm ³ /cm ³	0.39
Volumetric Water Content in Vadose Zone	θ _{ws}	cm ³ /cm ³	0.15
Volumetric Water Content in Foundation or Wall Cracks	θ _{wcrack}	cm ³ /cm ³	0.15
Volumetric Air Content in Capillary Fringe	θ _{acap}	cm ³ /cm ³	0.04
Volumetric Air Content in Vadose Zone	θ _{as}	cm ³ /cm ³	0.28
Volumetric Air Content in Foundation or Wall Cracks	θ _{acrack}	cm ³ /cm ³	0.28
GROUNDWATER PARAMETERS			
Depth to Groundwater	L _{gw}	cm	300
Hydraulic Conductivity	K	cm/year	90000
Hydraulic Gradient	i	cm/cm	0.01
Groundwater Darcy Velocity	U _{gw}	cm/year	900
Groundwater Mixing Zone Length	L _{mz}	cm	1500
Groundwater Mixing Zone Thickness	δ _{gw}	cm	200
Groundwater Mixing Zone Width	W _{gw}	cm	1500
Infiltration Rate	I	cm/year	30
AMBIENT AIR PARAMETERS			
Breathing Zone Height	δ _a	cm	200
Wind Speed Within the Breathing Zone	U _a	cm/s	225
ENCLOSED SPACE PARAMETERS			
Enclosed Space Air Exchange Rate			
Residential	ER	1/sec	0.00014
Commercial/Construction Worker	ER	1/sec	0.00023
Enclosed Space Volume/Infiltration Area Ratio			
Residential	L _b	cm	200
Commercial/Construction Worker	L _b	cm	300
Enclosed Space Foundation or Wall Thickness			
Residential	L _{crack}	cm	15
Commercial/Construction Worker	L _{crack}	cm	15
Areal Fraction of Cracks in Foundation or Walls			
Residential	η	cm ² /cm ²	0.005
Commercial/Construction Worker	η	cm ² /cm ²	0.005
PARTICULATE EMISSION			
Particulate Emission Factor	PEF	m ³ /kg	1.18x10 ⁶
AVERAGING TIME FOR VAPOR FLUX			
Resident Child	τ	sec	1.89x10 ⁸
Resident Adult	τ	sec	9.46x10 ⁸
Commercial Worker	τ	sec	7.88x10 ⁸
Construction Worker	τ	sec	3.15x10 ⁶
GROUNDWATER USE			
Distance to the Point of Exposure (X _{poe})	X _{poe}	ft	500
Longitudinal Dispersivity	a _x	ft	50
Transverse Dispersivity	a _y	ft	16.67
Vertical Dispersivity	a _z	ft	2.5
Distance to the Point of Compliance (X _{poc})	X _{poc}	ft	10
Longitudinal Dispersivity	a _x	ft	1
Transverse Dispersivity	a _y	ft	0.33
Vertical Dispersivity	a _z	ft	0.05

TABLE 4-1
KDHE TIER 2 RISK-BASED SCREENING LEVELS

Chemical Name	CAS No.	RESIDENTIAL SCENARIOS			NON - RESIDENTIAL SCENARIOS		
		Soil Pathway	Soil to Ground Water Protection Pathway *	Ground Water Pathway	Soil Pathway	Soil to Ground Water Protection Pathway *	Ground Water Pathway
		(mg/kg)	(mg/kg)	(ug/L)	(mg/kg)	(mg/kg)	(ug/L)
Benzene	71-43-2	15.9 c	0.168	5 m	28.2 c	0.168	5 m
Toluene	108-88-3	4320 n	51.2	1000 m	29800 n	51.2	1000 m
Ethylbenzene	100-41-4	82 c	65.6	700 m	145 c	65.6	700 m
Xylenes (mixed)	1330-20-7	936 n	809	10000 m	1410 n	809	10000 m
1,2 Dichloroethane (DCA)	107-06-2	6.27 c	0.06	5 m	10.9 c	0.06	5 m
MethylTert-butyl Ether (MtBE)	1634-04-4	585 c	0.848	133 c	1050 c	1.66	262 c
Naphthalene	91-20-3	30.5 c	0.349	1.11 c	64.7 c	0.659	2.11 c
Ethylene Dibromide (EDB)	106-93-4	.483 c	0.000598	0.05 m	.859 c	0.000598	0.05 m
TPH (GRO)		220	79.3	500	450	79.3	500
TPH (DRO)		2000	5440	500	20000	7830	720

August 2010

Footnotes:

n = value based on non-carcinogenic health risk, with a hazard index (HI) = 1
c = value based on carcinogenic health risk with a target cancer risk of 10E-5
m = groundwater value is equal to the EPA MCL

Table 5-1a
RISK BASED SCREENING LEVELS FOR a RESIDENT CHILD

Chemical Name	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUND WATER
	Inhalation of Vapors and Particulates, Dermal Contact with, and Accidental Ingestion (mg/kg)	Indoor Inhalation of Vapor Emissions (mg/kg)	Indoor Inhalation of Vapor Emissions (<i>u</i> g/kg)
Benzene	15.3	0.558	550
Toluene	1310*	285	183000
Ethylbenzene	78.6	4.78	1680
Xylenes (mixed)	191	10.7	4190
1,2 Dichloroethane (DCA)	6	0.265	658
Methyl tert-Butyl Ether (MtBE)	561	26.4	143000
Naphthalene	29.4	20.8	1540
Ethylene Dibromide (EDB)	0.462	0.045	96.60

Oct-10

Notes:

Soil concentrations are presented on a dry weight bases

*: Calculated RBSL's exceeded saturated soil concentrations and hence saturated soil concentrations are listed as RBSL's.

Table 5-1b
RISK BASED SCREENING LEVELS FOR a RESIDENT ADULT

Chemical Name	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUND WATER
	Inhalation of Vapors and Particulates, Dermal Contact with, and Accidental Ingestion (mg/kg)	Indoor Inhalation of Vapor Emissions (mg/kg)	Indoor Inhalation of Vapor Emissions (<i>u</i> g/kg)
Benzene	16	0.262	258
Toluene	1310*	670	430000
Ethylbenzene	82.4	2.24	787
Xylenes (mixed)	421*	25.2	9830
1,2 Dichloroethane (DCA)	6.28	0.124	309
Methyl tert-Butyl Ether (MtBE)	589	12.4	67200
Naphthalene	31.4	11.2	829
Ethylene Dibromide (EDB)	0.485	0.019	45.40

Oct-10

Notes:

Soil concentrations are presented on a dry weight bases

*: Calculated RBSL's exceeded saturated soil concentrations and hence saturated soil concentrations are listed as RBSL's.

Table 5-1c
RISK BASED SCREENING LEVELS FOR a COMMERCIAL WORKER

Chemical Name	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUND WATER
	Inhalation of Vapors and Particulates, Dermal Contact with, and Accidental Ingestion (mg/kg)	Indoor Inhalation of Vapor Emissions (mg/kg)	Indoor Inhalation of Vapor Emissions (<i>u</i> g/kg)
Benzene	25.4	1.09	1070
Toluene	1310*	1310*	526000
Ethylbenzene	131	9.31	3260
Xylenes (mixed)	421*	87.1	34000
1,2 Dichloroethane (DCA)	9.84	0.515	1280
Methyl tert-Butyl Ether (MtBE)	940	51.5	279000
Naphthalene	55.8	46.3	3440
Ethylene Dibromide (EDB)	0.772	0.0788	188.00

Oct-10

Notes:

Soil concentrations are presented on a dry weight bases

*: Calculated RBSL's exceeded saturated soil concentrations and hence saturated soil concentrations are listed as RBSL's.

Table 5-1d
RISK BASED SCREENING LEVELS FOR a CONSTRUCTION WORKER

Chemical Name	SOIL TO TYPICAL DEPTH OF CONSTRUCTON
	Inhalation of Vapors and Particulates, Dermal Contact with, and Accidental Ingestion (mg/kg)
Benzene	96.2
Toluene	1310*
Ethylbenzene	781*
Xylenes (mixed)	421*
1,2 Dichloroethane (DCA)	111
Methyl tert-Butyl Ether (MtBE)	10800
Naphthalene	136
Ethylene Dibromide (EDB)	8.82

Oct-10

Notes:

Soil concentrations are presented on a dry weight bases

*: Calculated RBSL's exceeded saturated soil concentrations and hence saturated soil concentratoins are listed as RBSL's.

TABLE 5-2

TIER 3A RBSLs FOR SOIL CONCENTRATIONS (FOR LEACHING TO GROUNDWATER) FOR DIFFERENT DISTANCES TO THE GROUNDWATER EXPOSURE POINT

CHEMICALS OF CONCERN	WATER STANDARD [ug/L]	TIER 3A RBSLs FOR SOIL CONCENTRATION AT THE SOURCE FOR DIFFERENT DISTANCES TO THE EXPOSURE POINT											
		0 ft.	50 ft.	100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.	500 ft.	1000 ft.
		[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]	[mg/kg]
Benzene	5	0.04	0.0523	0.124	0.249	0.425	0.651	0.927	1.25	1.63	2.06	2.54	10.1
Toluene	1000	12.4	16.3	38.7	77.5	132	202	288	390	507	640	789	1310 *
Ethylbenzene	700	16.2	21.1	50.2	101	172	263	375	507	659	781 *	781 *	781 *
Xylenes (mixed)	10000	421	421	421	421 *	421 *	421 *	421 *	421 *	421 *	421 *	421 *	421 *
1,2 Dichloroethane (DCA)	5	0.0126	0.0165	0.0392	0.0786	0.134	0.205	0.293	0.396	0.514	0.649	0.8	3.18
Methyl Tertbutyl Ether (MtBE)	133	0.146	0.191	0.455	0.911	1.55	2.38	3.39	4.59	5.96	7.53	9.27	36.8
Ethylene Dibromide (EDB)	0.05	0.0001250	0.000164	0.000389	0.000780	0.00133	0.00204	0.0029	0.00392	0.0051	0.00644	0.00749	0.0315
Naphthalene	1.11	0.0855	0.112	0.266	0.532	0.908	1.39	1.98	2.68	3.48	4.4	5.42	21.5

Note:

* Calculated Tier 3A RBSLs for soil concentrations exceeded saturated soil concentration and hence the saturated soil concentrations are listed as the Tier 3A RBSLs for soil concentrations protective of groundwater. Soil concentrations are presented on a dry weight basis.

TABLE 5-3
TIER 3A DILUTION ATTENUATION FACTORS

Distance from source (feet)	Dilution Attenuation Factor With No Decay (- -)
25	1.01
50	1.3
100	3.1
200	10.6
300	23.2
400	40.8
500	63.4
1000	251.8