



## CHEMICAL UPDATE WORKSHEET

<b>Chemical Name:</b>	<b>2,4-Dinitrotoluene</b>
<b>CAS #:</b>	<b>121-14-2</b>
<b>Revised By:</b>	RRD Toxicology Unit
<b>Revision Date:</b>	September 16, 2015

### (A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
<b>Molecular Weight (g/mol)</b>	183.15	182.14	EPI	EXP
<b>Physical State at ambient temp</b>	Solid	Solid	MDEQ	
<b>Melting Point (°C)</b>	343	71.00	EPI	EXP
<b>Boiling Point (°C)</b>	300	300.00	EPI	EXP
<b>Solubility (ug/L)</b>	2.70E+5	2.00E+05	EPI	EXP
<b>Vapor Pressure (mmHg at 25°C)</b>	0.0001748	1.47E-04	EPI	EXP
<b>HLC (atm-m<sup>3</sup>/mol at 25°C)</b>	9.26E-8	5.40E-08	EPI	EXP
<b>Log Kow (log P; octanol-water)</b>	2.01	1.98	EPI	EXP
<b>Koc (organic carbon; L/Kg)</b>	94.6	575.6	EPI	EST
<b>Ionizing Koc (L/kg)</b>		NR	NA	NA
<b>Diffusivity in Air (Di; cm<sup>2</sup>/s)</b>	0.203	3.82E-02	W9	EST
<b>Diffusivity in Water (Dw; cm<sup>2</sup>/s)</b>	7.06E-6	8.1053E-06	W9	EST

	Part 201 Value	Updated Value	Reference Source	Comments
<b>Soil Water Partition Coefficient (Kd; inorganics)</b>	NR	NR	NA	NA
<b>Flash Point (°C)</b>	NA	207	CRC	EXP
<b>Lower Explosivity Level (LEL; unit less)</b>	NA	NA	NA	NA
<b>Critical Temperature (K)</b>		814.00	EPA2001	EXP
<b>Enthalpy of Vaporization (cal/mol)</b>		1.35E+04	EPA2001	EXP
<b>Density (g/mL, g/cm<sup>3</sup>)</b>		1.379	PC	EXP
<b>EMSOFT Flux Residential 2 m (mg/day/cm<sup>2</sup>)</b>	2.49E-08	3.51E-07	EMSOFT	EST
<b>EMSOFT Flux Residential 5 m (mg/day/cm<sup>2</sup>)</b>	2.49E-08	3.51E-07	EMSOFT	EST
<b>EMSOFT Flux Nonresidential 2 m (mg/day/cm<sup>2</sup>)</b>	2.80E-08	4.40E-07	EMSOFT	EST
<b>EMSOFT Flux Nonresidential 5 m (mg/day/cm<sup>2</sup>)</b>	2.80E-08	4.40E-07	EMSOFT	EST

**(B) Toxicity Values/Benchmarks**

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
<b>Reference Dose (RfD) (mg/kg/day)</b>	2.0E-3	1.0E-3	ATSDR, 2013	
<b>RfD details</b>	Dog 2-year feeding (gelatin capsule) study (Ellis et al., 1985); NOAEL = 0.2mg/kg/day; UF = 100; Critical effect = neurotoxicity, heinz bodies, and biliary tract hyperplasia. CCD/RRD date: 7/1/1997	<p><b>Tier 2 Source:</b>  <b>ATSDR:</b>  <b>Basis:</b> ATSDR RfD represents the most current and best available assessment. ATSDR assessment is more recent than IRIS.  <b>ATSDR (4/2013) oral chronic MRL =</b> 1.0E-3 mg/kg-day.  <b>Critical Study:</b>                      1) U.S. Army. 1979. Mammalian toxicity of munitions compounds. Phase III: Effects of lifetime exposure. Part I. 2,4-Dinitrotoluene. Final report no. 7. Fort Detrick, MD: U.S. Army and Medical Bioengineering Research Development Laboratory. ADA077692.                      2) Ellis HV, Hong CB, Lee CC, et al. 1985. Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part I. Beagle dog. J Am Coll Toxicol 4:233-242.  <b>Method(s):</b> Young beagle dogs (6 dogs/sex/group; age not specified) were administered 0, 0.2, 1.5, or 10 mg/kg/day 2,4-DNT in capsules for 24 months.  <b>Critical effect:</b> hematological effects (decreased erythrocyte count)  <b>End point or Point of Departure (POD):</b> BMDL<sub>1SD</sub> = 0.12 mg/kg/day  <b>Uncertainty Factors:</b> UF = 100 (10 each for intraspecies variability and interspecies extrapolation)  <b>Source and date:</b> ATSDR, 4/2013; Acute oral MRL = 0.05 mg/kg/day; Oral intermediate MRL = 0.007 mg/kg/day.</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> Per IRIS (2/01/1993), RfD = 2.0E-3 mg/kg-day:  <b>Critical Study:</b> Ellis, H.V., C.B. Hong, C.C. Lee, J.C. Dacre and J.P. Glennon. 1985. Sub chronic and chronic toxicity studies of 2,4-dinitrotoluene. Part I. Beagle dogs. J. Am. College Toxicol. 4(4): 233-242.)  <b>Method(s):</b> Beagle dogs fed 0, 0.2, 1.5, or 10 mg/kg/day 2,4- dinitrotoluene (2,4-DNT) in gelatin capsules for up to 24 months.</p>	Complete	



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p><b>Critical effect:</b> neurotoxicity and the presence of Heinz bodies and biliary tract hyperplasia</p> <p><b>End point or Point of Departure (POD):</b> NOAEL = 0.2 mg/kg/day; LOAEL = 1.5 mg/kg/day.</p> <p><b>Uncertainty Factors:</b> UF = 100 (10 each for intraspecies variability and interspecies extrapolation)</p> <p><b>Source and date:</b> IRIS, Last revision date - 2/01/1993. An IRIS screening-level review in 2002 did not identify any critical new studies.</p> <p><b>PPRTV:</b> No PPRTV record is available for 2,4-DNT however one is available for technical grade DNT dated 4/4/2013. tgDNT is comprised of 76% 2,4-DNT and 19% 2,6-DNT; the remaining 5% is a combination of the four other DNT isomers: 2,3-, 2,5, 3,4- and 3,5-DNT. A subchronic or chronic p-RfD is not available at this time.</p> <p><b>ATSDR MRL (4/2013):</b> See above.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ:</b> Per DEQ-RRD (8/14/1991), RfD = 2E-3 mg/kg/day. Dog 2-year feeding (gelatin capsule) study (Ellis et al., 1985); NOAEL = 0.2mg/kg/day; UF = 100; Critical effect = neurotoxicity, heinz bodies, and biliary tract hyperplasia.</p>		
<b>Oral Cancer Slope Factor (CSF) (mg/kg-day)<sup>-1</sup></b>	<b>1.1E-1</b>	6.7E-1	USEPA, 2008	
<b>CSF details</b>	Rat chronic dietary study of 2,4- (98%) and 2,6-dinitrotoluene combined (Ellis et al., 1979). Benign and malignant tumors at multiple sites combined in female rats.	<p><b>Tier 3 Source:</b>  <b>USEPA Office of Water Assessment:</b>  <b>Basis:</b> EPA is a more current assessment than MDEQ. EPA Office of Water (2008). No Tier 1 and 2 values.  <b>CSF = 6.67E-1 (mg/kg-day)<sup>-1</sup>:</b>  <b>Critical Studies :</b> Ellis et al., 1979; Lee et al., 1985</p> <p>1) Ellis, H.V., J.H. Hagensen, J.R. Hodgson, et al. 1979. Mammalian toxicity of munitions compounds. Phase BI: Effects of lifetime exposure. Part I. 2,4-Dinitrotoluene. Final Report No. 7. Kansas City, MO: Midwest Research Institute. Contract No. DAMD 17-74-C-4073, ADA077 692 (as cited in ATSDR, 1998).</p> <p>2) Lee, C.C., C.B. Hong, H.V. Ellis, et al. 1985. Sub chronic and chronic toxicity</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
	<p>Revised species scaling factor of (BWh/BWa) to the 0.25 power used for q* calculation. CCD date: 5/3/1989</p>	<p>studies of 2,4-dinitrotoluene. Part II. CD rats. J Am Coll Toxicol 4:243-256 (as cited in ATSDR, 1998). <b>Method(s):</b> CD (Sprague-Dawley) rats (38/sex/dose) were fed 2,4-DNT (98% pure, with 2% 2,6-DNT) in the diet, at concentrations of 0, 15, 100, or 700 ppm, for up to 2 years (Ellis et al., 1979; Lee et al., 1985). The intake of 2,4-DNT was 0, 0.57, 3.9, or 34 mg/kg/day for males and 0, 0.71, 5.1, or 45 mg/kg/day for females. The benchmark dose (BMD) was estimated using the numbers of female rats with mammary gland tumors. For a benchmark risk (BMR) level of 0.10, the estimated BMD value is 0.25 mg/kg/day with a lower bound (95%) (BMDL) of 0.15 mg/kg/day using the multistage model. The BMDL was used as the point of departure selected for the quantification of cancer risk from DNT.</p> <ol style="list-style-type: none"> <li>1) <i>Dose response data: Tumor Type</i> - Liver: hepatocellular carcinomas, neoplastic nodules; mammary gland: adenomas, fibroadenomas, fibromas, adenocarcinomas/carcinomas; <i>Test Species</i> - female rats; <i>Route</i> - Oral (diet)</li> <li>2) <i>Extrapolation method:</i></li> </ol> <p><b>Carcinogen Weight-of-Evidence (WOE) Class:</b> In this assessment, the cancer risk potential and estimates for each of the isomers (i.e., 2,4-DNT and 2,6-DNT) are the same as that of the mixture. The U.S. EPA (2008) classifies the 2,4-DNT/2,6-DNT mixture as “likely to be carcinogenic to humans.”</p> <p><b>IRIS WOE Basis:</b> Based on hepatic tumor initiation-promotion experiments, Leonard et al. (1983, 1986) and Mirsalis and Butterworth (1982) concluded that Tg-DNT has tumor-promoting and –initiating activity. They further concluded that 2,6-DNT is a complete hepatocarcinogen and has the primary role in Tg-DNT’s carcinogenic activity.</p> <p><b>Source and Date:</b> EPA-Office of Water Drinking Water health Advisory for 2,4-Dinitrotoluene and 2,6-Dinitrotoluene (Doc # 822-R-08-010), 1/2008</p> <p><b>Tier 1 and 2 Sources:</b> <b>IRIS:</b> Per IRIS (4/1/1993), no value at this time. IRIS has not evaluated 2,4-DNT for human carcinogenic potential. <b>PPRTV:</b> No PPRTV record available at this time.</p>		

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p><b>MRL:</b> NA; MRLs are for non-cancer effects only.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ:</b> MDEQ-RRD CSF = 1.1E-1 (mg/kg-day)<sup>-1</sup>  <b>Critical Study(ies):</b> Ellis et al., 1979  <b>Method(s):</b> A three generation study, 10-24 Sprague-Dawley rats/sex were fed diets containing 0, 15, 100, or 700 ppm (approximately 0, 0.75, 5, or 35 mg/kg/day, respectively) 2,4-DNT for 6 months prior to mating. The study was terminated during the third generation after weaning of the second litter (Fb). The highest dose was associated with reduced parental BW, reduced pup survival, and reduced fertility in F1 animals, and slightly lower mean litter size and pup BW. At mid- and low-dose levels, there were slight reductions in BW for first- and third-generation pups; however, parental fertility and offspring viability were not affected. The LOAEL was 35 mg/kg/day, based on severe reductions in fertility. The NOAEL was 5 mg/kg/day.</p> <p><b>Methods:</b>                      1) <i>Dose response data:</i> Tumor Type - benign and malignant tumors at multiple sites; <i>Test Species</i> – female rats; <i>Route</i> - oral (diet)                      2) <i>Extrapolation method:</i> Linear; revised species scaling factor of (BWh/BWa) to the 0.25 power used for q* calculation.  <b>Carcinogen Weight-of-Evidence (WOE) Class:</b> No information  <b>Source and Date:</b> MDEQ-CCD/RRD, 5/3/1989.</p>		
<b>Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)</b>	2.0E+0	2.0E+0	MDEQ, 1999	
<b>RfC/ITSL details</b>	The occupational TLV of 0.2 mg/m3 was designed to be protective of methemoglobin	<p><b>Tier 3 Source:</b>  <b>MDEQ:</b>  <b>Basis:</b> MDEQ was the only value returned in the Tier 3 search. See details below.</p> <p><b>Tier 1 and 2 Sources:</b></p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
	<p>nia. Neurological effects were also noted via the oral route.                      CCD/AQD date: 9/27/1999</p>	<p><b>IRIS:</b> Per IRIS (12/20/1993), no value at this time. An EPA screening-level review in 2002 did not identify any critical new studies.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> Per ATSDR (12/2014), no inhalation chronic MRL at this time.</p> <p><b>Tier 3 Sources:</b>  <b>MDEQ:</b> AQD (1999) ITSL = 2.0E+0 µg/m<sup>3</sup>:  <b>Basis:</b> The occupational TLV of 0.2 mg/m<sup>3</sup> was designed to be protective of methemoglobinemia. Neurological effects were also noted via the oral route.  <b>Source and date:</b> MDEQ-CCD/AQD, 9/27/1999</p> <p><b>OTHERS:</b> No value is available at this time from these Tier 3 sources/databases: HEAST, NTP ROC, health and environmental agencies of California, Massachusetts, Minnesota, New Jersey, New York, and Texas, Canada, The Netherlands (RIVM), WHO (IARC), WHO (IPCS/INCHEM), OECD HPV, and ECHA (REACH).</p>		
<b>Inhalation Unit Risk Factor (IURF) ((µg/m<sup>3</sup>)<sup>-1</sup>)</b>	2.0E-4	8.9E-5	CALEPA, 2011	
<b>IURF details</b>	<p>Based on male mice kidney tumors from a chronic bioassay by Hong et al. (1985).</p>	<p><b>Tier 3 Source:</b>  <b>CALEPA:</b>  <b>Basis:</b> CALEPA (2011) IURF is based on “transformed” dose rates for the animals in the oral study by Lee et al. (1978). Minnesota and New Jersey adopted the CALEPA value. MDEQ derived the potency factor using the Hong et al. (1985) study. MDEQ eliminated the highest dose from the Hong data to run the estimate using the Global 82 program. See details below.</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> Per IRIS (4/1/1993), no value at this time. IRIS has not evaluated 2,4-DNT for human carcinogenic potential.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> NA; MRLs are for non-cancer effects only.</p> <p><b>Tier 3 Sources:</b></p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p><b>MDEQ:</b> MDEQ (1999) IURF = <math>1.2E-4 (\mu\text{g}/\text{m}^3)^{-1}</math>:  <b>Basis:</b> IURF is based on oral chronic studies.  <b>Critical Study:</b> Hong, C.B., H.V. Ellis, C.C. Lee, H. Sprinz, J.C. Dacre and J.P. Glennon. 1985. Sub chronic and chronic toxicity studies of 2,4-dinitrotoluene. Part III: CD-1 Mice. J. Am. College Toxicol. 4(4): 257-269.  <b>Method(s):</b> CD-1 mice (38/sex/group) were fed 0, 14, 95, or 898 mg/kg/day 2,4-DNT in the diet for up to 24 months.  <b>Calculation:</b> The Global 82 program was used to derive oral slope factors for 2,4-dinitrotoluene from the available cancer bioassays. However, the chi-square statistic was found to be unacceptable in the Hong et al. (1985) study. Pursuant to Rule 231(3)(b) the highest dose was eliminated from the Hong et al. (1985) data used in the Global 82 program and the program was re-run. The raw slope factor data was then used in the animal to human extrapolation pursuant to Rule 231(3)(c) (see Table 4). The unit risk was calculated according to Rule 231(3)(f)(ii). The final IRSL was derived from the Hong et al. (1985) study where an increased incidence of kidney tumors was observed in male mice.  <b>Source and Date:</b> MDEQ-CCD/AQD, 9/27/1999</p> <p><b>California OEHHA (CALEPA):</b> IURF= <math>0.000089</math> or <math>8.9E-5 (\mu\text{g}/\text{m}^3)^{-1}</math>.  <b>Basis:</b> The USEPA (1980) derived a “transformed” dose rate of 0, 0.71, 3.9, and 34.0 mg/kg-day for the animals in the study by Lee et al. (1978) exposed to 0, 15 100 and 700 ppm 2,4-DNT in their diet, respectively. This study was selected over the NCI (1978) study because of published reservations by NCI concerning the adequacy of the study for estimating cancer potency in humans. The resulting <math>q_{\text{human}}</math> is <math>0.31 (\text{mg}/\text{kg}\text{-day})^{-1}</math>. A unit risk value based upon air concentrations was derived by OEHHA using an assumed human breathing rate of <math>20 \text{ m}^3/\text{day}</math>, 70 kg human body weight, and 100% fractional absorption after inhalation exposure. The calculated unit risk value is <math>8.9 E-5 (\mu\text{g}/\text{m}^3)^{-1}</math>.  <b>Key study:</b> Lee CC, Ellis HV, Kowalski JJ, Hodgson JR, Short RD, Jagdis BC, Reddig TW and Minor JL. 1978. Mammalian toxicity of munition compounds. Phase II. Effects of multiple doses and Phase III. Effects of lifetime exposure.</p>		

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>Part II. 2,4-Dinitrotoluene. US Army Medical Bioengineering Research and Development Laboratory. Contract No. DAMD-17-74-C-4073. Midwest Research Institute, Kansas City, MO. NTIS ADA 061715. Source: OEHHA Technical Support Document for Describing Available Cancer Potency Factors, Appendix B. Updated 2011, p.257</p> <p><b>Minnesota PCA:</b> IURF= 8.90E-05 (<math>\mu\text{g}/\text{m}^3</math>)<sup>-1</sup> based on CALEPA IURF.</p> <p><b>New Jersey DEP:</b> IURF= 8.90E-05 (<math>\mu\text{g}/\text{m}^3</math>)<sup>-1</sup> based on CALEPA IURF.</p> <p><b>Other Tier 3:</b> No value is available at this time from these Tier 3 sources/databases: HEAST, NTP ROC, health and environmental agencies of Massachusetts, New York, and Texas, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), ECHA (REACH) and OECD HPV.</p>		
<b>Mutagenic Mode of Action (MMOA)? (Y/N)</b>	--	NO	USEPA, 2015	
<b>MMOA Details</b>	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
<b>Developmental or Reproductive Effector? (Y/N)</b>	No	No. The RfD and RfC/ITSL are not based on a reproductive-developmental effect.	MDEQ, 2015	
<b>Developmental or Reproductive Toxicity Details</b>	NA	<p>EPA (2008) reported that studies of systemic identified effects of 2,4-DNT on the testes and spermatogenesis following short and long term exposures (Ellis et al., 1979; Hong set al., 1985; Kazuka et al., 1979; Lee et al., 1978, 1985 and McGown et al., 1983).</p> <p>A three-generation study (Ellis et al., 1979), where Sprague-Dawley rats (10-24/sex/dose) were fed approximately 0, 0.75, 5, or 35 mg/kg/day 2,4-DNT (98% pure) for up to 6 months prior to mating reported reduced parental BW, reduced pup survival, reduced fertility in F1 animals, and slightly lower mean litter size and pup BW in the highest dose. At mid- and low-dose levels, there were slight reductions in BW for first- and third-generation pups; however, parental fertility</p>		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		and offspring viability were not affected. The LOAEL was 35 mg/kg/day, based on severe reductions in fertility. The NOAEL was 5 mg/kg/day.		
State Drinking Water Standard (SDWS) (ug/L)	--	NA	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NA	SDWA, 1976 and USEPA SMCL List	
SMCL details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	NA	NA	NA	
Aesthetic Value details	NA	NA		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA	NA	
Others				

**(C) Chemical-specific Absorption Factors**

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS <sub>gi</sub> )	---	1.0	MDEQ, 2015/USEPA RAGS-E	
ABS <sub>gi</sub> details		RAGS E (EPA, 2004) Default Value		
Skin absorption efficiency value (AE <sub>d</sub> )	---	0.1	MDEQ, 2015	
AE <sub>d</sub> details				
Ingestion Absorption Efficiency (AE <sub>i</sub> )		1.0	MDEQ, 2015	
AE <sub>i</sub> Details				
Relative Source Contribution for Water (RSC <sub>w</sub> )		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC <sub>s</sub> )		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC <sub>A</sub> )		1.0	MDEQ, 2015	
Others				

**(D) Rule 57 Water Quality Values and GSI Criteria**

<b>Current GSI value (µg/L)</b>	NA
<b>Updated GSI value (µg/L)</b>	NA
<b>Rule 57 Drinking Water Value (µg/L)</b>	NA

	<b>Rule 57 Value (µg/L)</b>	<b>Verification Date</b>
<b>Human Non-cancer Values- Drinking water source (HNV-drink)</b>		
<b>Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)</b>		
<b>Wildlife Value (WV)</b>		
<b>Human Cancer Values for Drinking Water Source (HCV-drink)</b>		
<b>Human Cancer values for non-drinking water source (HCV-Non-drink)</b>		
<b>Final Chronic Value (FCV)</b>		
<b>Aquatic maximum value (AMV)</b>		
<b>Final Acute Value (FAV)</b>		

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 [website](#)
2. MDEQ Rule 57 [table](#)



**(E) Target Detection Limits (TDL)**

	<b>Value</b>	<b>Source</b>
<b>Target Detection Limit – Soil (<math>\mu\text{g}/\text{kg}</math>)</b>	330	MDEQ, 2015
<b>Target Detection Limit – Water (<math>\mu\text{g}/\text{L}</math>)</b>	5	MDEQ, 2015
<b>Target Detection Limit – Air (ppbv)</b>	NA	MDEQ, 2015
<b>Target Detection Limit – Soil Gas (ppbv)</b>	NA	MDEQ, 2015

**CHEMICAL UPDATE WORKSHEET ABBREVIATIONS:**

CAS # - Chemical Abstract Service Number.

**Section (A) Chemical-Physical Properties****Reference Source(s):**

CRC	Chemical Rubber Company Handbook of Chemistry and Physics, 95th edition, 2014-2015
EMSOFT	USEPA Exposure Model for Soil-Organic Fate and Transport (EMSOFT) (EPA, 2002)
EPA2001	USEPA (2001) Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature. Office of Solid Waste and Emergency Response, Washington, D.C.
EPA4	USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.
EPI	USEPA's Estimation Programs Interface SUITE 4.1, Copyright 2000-2012
HSDB	Hazardous Substances Data Bank
MDEQ	Michigan Department of Environmental Quality
NPG	National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards
PC	National Center for Biotechnology Information's PubChem database
PP	Syracuse Research Corporation's PhysProp database
SCDM	USEPA's Superfund Chemical Data Matrix
SSG	USEPA's Soil Screening Guidance: Technical Background Document, Second Edition, 1996
USEPA/EPA	United States environmental protection agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

W9 USEPA's User Guide for Water9 Software, Version 2.0.0, 2001

**Basis/Comments:**

EST	estimated
EXP	experimental
EXT	extrapolated
NA	not available or not applicable
NR	not relevant

**Section (B) Toxicity Values/Benchmarks****Sources/References:**

ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CAL DTSC	California Department of Toxic Substances Control
CAL OEHHA	CAEPA Office of Environmental Health Hazard Assessment
CCD	MDEQ Chemical Criteria Database
ECHA	European Chemicals Agency (REACH)
OECD HPV	Organization for Economic Cooperation and Development HPV Database
HEAST	USEPA's Health Effects Assessment Summary Tables
IRIS	USEPA's Integrated Risk Information System
MADEP	Massachusetts Department of Environmental Protection
MDEQ/DEQ	Michigan Department of Environmental Quality
DEQ-CCD/AQD	MDEQ Air Quality Division
DEQ-CCD/RRD	MDEQ Remediation and Redevelopment Division
DEQ-CCD/WRD	MDEQ Water Resources Division
MNDOH	Minnesota Department of Health
NJDEP	New Jersey Department of Environmental Protection

NYDEC	New York State Department of Environmental Conservation
OPP/OPPT	USEPA's Office of Pesticide Programs
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Values
RIVM	The Netherlands National Institute of Public Health and the Environment
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USEPA OSWER	USEPA Office of Solid Waste and Emergency Response
USEPA MCL	USEPA Maximum Contaminant Level
WHO	World Health Organization
WHO IPCS	International Programme on Chemical Safety (IPCS/INCHEM)
WHO IARC	International Agency for Research on Cancers
NA	Not Available.
NR	Not Relevant.

**Toxicity terms:**

BMC	Benchmark concentration
BMCL	Lower bound confidence limit on the BMC
BMD	benchmark dose
BMDL	Lower bound confidence limit on the BMD
CSF	Cancer slope Factor
CNS	Central nervous system
IURF or IUR	Inhalation unit risk factor
LOAEL	Lowest observed adverse effect level
LOEL	Lowest observed effect level
MRL	Minimal risk level (ATSDR)
NOAEL	No observed adverse effect level
NOEL	No observed effect level
RfC	Reference concentration
RfD	Reference dose
p-RfD	Provisional RfD

aRfD	Acute RfD
UF	Uncertainty factor
WOE	Weight of evidence

**Section (C) Chemical-specific Absorption Factors**

MDEQ	Michigan Department of Environmental Quality
USEPA RAGS-E	United States Environmental Protection Agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

**Section (D) Rule 57 Water Quality Values and GSI Criteria**

GSI	Groundwater-surface water interface
NA	A value is not available or not applicable.
ID	Insufficient data to derive value
NLS	No literature search has been conducted