



## CHEMICAL UPDATE WORKSHEET

<b>Chemical Name:</b>	<b>Heptachlor Epoxide</b>
<b>CAS #:</b>	<b>1024-57-3</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
Molecular Weight (g/mol)	389.32	389.32	EPI	EXP
Physical State at ambient temp	Solid	Solid	MDEQ	
Melting Point (°C)	434	160.00	EPI	EXP
Boiling Point (°C)	---	NA	NA	
Solubility (ug/L)	200	200	EPI	EXP
Vapor Pressure (mmHg at 25°C)	0.000004332	1.95E-05	EPI	EXP
HLC (atm-m <sup>3</sup> /mol at 25°C)	9.50E-6	2.10E-05	EPI	EXP
Log Kow (log P; octanol-water)	5.0	4.98	EPI	EXP
Koc (organic carbon; L/Kg)	82300	1.011E+04	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm <sup>2</sup> /s)	0.0132	3.56E-02	W9	EST
Diffusivity in Water (Dw; cm <sup>2</sup> /s)	4.23E-6	4.16E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unitless)	NA	NA	NA	NA
Critical Temperature (K)		848.76	EPA2001	EXP
Enthalpy of Vaporization (cal/mol)		1.60E+04	EPA2001	EST
Density (g/mL, g/cm <sup>3</sup> )		NA	NA	NA
EMSOFT Flux Residential 2 m (mg/day/cm <sup>2</sup> )	9.47E-08	1.37E-06	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm <sup>2</sup> )	9.47E-08	1.37E-06	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm <sup>2</sup> )	1.11E-07	1.73E-06	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm <sup>2</sup> )	1.11E-07	1.73E-06	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>	8.5E-6	1.3E-5	IRIS, 1991	
<b>RfD details</b>	<p>IRIS uses a different conversion factor resulting in a RfD of 1.3E-5). Used a conversion factor of 0.017 (x 0.5ppm); 60-week dog feed study. No NOAEL; LOAEL = 0.5ppm = 8.5E-6 mg/kg. Critical effect = increase liver to body weight ratio (Dow Chemical Co. 1958).</p>	<p><b>Tier 1 Source:</b>  <b>IRIS:</b>  <b>Basis:</b> IRIS and DEQ values are identical (IRIS value is rounded). IRIS RfD selected as it represents a preferred source.  <b>IRIS 03/01/1991:</b> RfD = 1.3E-5 mg/kg/day  <b>Critical Study:</b> Dow Chemical Company. 1958. MRID No. 00061912. Available from EPA. Write to FOI, EPA, Washington, DC 20460. (Same as study cited by SWQD as noted in Tier 3 Values by the University of Cincinnati (1958)).  <b>Methods:</b> Beagle dogs from 23 to 27 weeks of age were divided into five groups (3 females and 2 males) and given diets containing 0, 0.5, 2.5, 5 or 7.5 ppm of heptachlor epoxide for 60 weeks. Conversion factor 1 ppm = 0.025 mg/kg/day (assumed dog food consumption).  <b>Critical effect:</b> Increased liver to body weight ratio in both males and females.  <b>Point of Departure:</b> LEL= 0.5 ppm (0.0125 mg/kg/day); NOEL none.  <b>Uncertainty Factors:</b> = 1,000 (10 for interspecies extrapolation, 10 for interspecies variability and 10 for lack of a NOEL).</p> <p><b>Tier 2 Sources:</b>  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> ATSDR reports that the available toxicity data for heptachlor epoxide are not suitable for the development of MRLs. ATSDR, 11/2007.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ-SWQD 09/28/2000:</b> RfD = 1.25E-5.  <b>Critical Study:</b> University of Cincinnati. 1958. A Summary of the Observations Pertaining to the Physiological Responses of Beagles When They Were Fed Diets Containing Various Concentrations of Heptachlor Epoxide Daily for a Period of 60 Weeks. Preliminary Report. Same as Dow Chemical Co. study described above.  <b>Method:</b> Pure heptachlor epoxide was added to the diets of male and female</p>		Complete

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>beagle dogs (3 females and 2 males per dose group) at concentrations of 0, 0.5, 2.5, 5 or 7.5 ppm for 60 weeks. Heptachlor epoxide was mixed in ethanol (95%) and the mixture was sprayed onto dry dog food.</p> <p><b>Critical effect:</b> Increased liver to body weight ratios were reported in a dose related fashion.</p> <p><b>End point or Point of Departure (POD):</b> The LOAEL for this study is 0.5 ppm (equivalent to 0.0125 mg/kg/d per EPA). NOAELs of 0.025 and 0.25 mg/kg/d are listed in IRIS for a two generation dog reproduction study and a three generation rat reproduction study, respectively, suggesting that the criteria derived using the LOAEL of 0.0125 mg/kg/d would be protective of reproductive effects.</p> <p><b>Uncertainty Factors:</b> = 1,000 (10 for interspecies extrapolation, 10 for interspecies variability, and 10 for LOAEL to NOAEL extrapolation).</p> <p><b>Source and date:</b> SWQD, August 28, 2000.</p>		
<b>Oral Cancer Slope Factor (CSF) (mg/kg-day)<sup>-1</sup></b>	2.9E+0	3.6E+0	MDEQ, 2000	
<b>CSF details</b>	<p>2 year in feed mouse study. C3H mice fed 0 or 10 ppm for 2 years decreased incidence of benign liver tumors &amp; liver hyperplasia (Davis, 1965). IRIS SF revised with new species scaling factor. RD calculation date: 9/20/99.</p>	<p><b>Tier 3 Source:</b> <b>MDEQ:</b> <b>Basis:</b> MDEQ-WRD (2000) oral CSF based on the Velsicol/IRDC (1973) data. MDEQ was selected due to deficiencies in the Davis study that was included in the quantitative assessment conducted by IRIS (1993). Similar to IRIS, California used both Davis (1965) and Velsicol/IRDC (1973) data. Minnesota, New Jersey and Texas adopted the EPA IRIS value. See details below.</p> <p><b>Tier 1 Source:</b> <b>IRIS (1993):</b> Oral CSF = 9.1E+0 per mg/kg-day.</p> <p><b>Critical Studies:</b></p> <ul style="list-style-type: none"> <li>Davis, K.J. 1965. Pathology Report on Mice Fed Aldrin, Dieldrin, Heptachlor and Heptachlor Epoxide for Two Years. Internal FDA memorandum to Dr. A.J. Lehman, July 19.</li> <li>Velsicol Chemical Corporation. 1973. MRID No. 00062678. Available from EPA. Write to FOI, EPA, Washington, D.C. 20460.</li> </ul> <p><b>Methods:</b> Davis (1965) fed groups of 100 male and 100 female C3H mice 0 or 10</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>ppm heptachlor epoxide for 2 years. The Velsicol Chemical Co. (1973) tested a 75:25 mixture of heptachlor epoxide: heptachlor in groups of 100 male and 100 female CD-1 mice. The mice were fed 0, 1, 5, and 10 ppm for 18 months.</p> <p><b>Critical Effects:</b> <u>Davis, 1965</u>: Survival was generally low, with 50% of controls and 9.5% of treated mice living 2 years. A 2-fold increase in benign liver lesions (hepatic hyperplasia and benign tumors) over the controls was reported. Reevaluation by Reuber (1977b) revealed a significant increase in liver carcinomas in the dosed group (77/81 in females and 73/79 in males) over the controls (2/53 in females and 22/73 in males). <u>Velsicol Chemical Co., 1973</u>: A statistically significant increase of hyperplasia was observed in the 5, and 10 ppm dose groups in both sexes. Reuber's reevaluation (U.S. EPA, 1985) resulted in a change in diagnosis for benign to liver carcinomas, thereby increasing the incidence of hepatic carcinomas (p&lt;0.01). Four independent pathologists concurred with Reuber's reevaluation.</p> <p><b>Point of Departure:</b> The Davis (1965) study was designed to be for lifetime exposure. Thus, although survival was low, no correction for duration of experiment was made. Five data sets (four in mice and one in rats) show an increased incidence of hepatocellular carcinomas in treated groups compared with controls. There are four slope factors, 27.7 per (mg/kg)/day for C3H male mice, 36.2 per (mg/kg)/day for C3H female mice, 1.04 per (mg/kg)/day for CD-1 female mice, and 6.48 per (mg/kg)/day for CD-1 male mice. Since mice were the more sensitive species tested and to avoid discarding relevant data, the quantitative estimate is based on the geometric mean of 9.1 per (mg/kg)/day. This geometric mean is consistent with the potency estimate from rats of 5.8 per (mg/kg)/day (CFN females).</p> <p><b>Carcinogen Weight-of-Evidence (WOE) Class:</b> B2 – probable human carcinogen.</p> <p><b>IRIS WOE Basis:</b> Sufficient evidence exists from rodent studies in which liver carcinomas were induced in two strains of mice of both sexes and in CFN female rats. Several structurally related compounds are liver carcinogens.</p> <p><b>Source:</b> IRIS, 7/1/1993.</p>		

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p><b>Tier 2 Sources:</b>  <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>  <b>MDEQ-WRD 09/28/2000:</b> Oral CSF = 3.6 per mg/kg-day.</p> <p><b>Critical Studies and Methods:</b></p> <ul style="list-style-type: none"> <li>• Reuber, M. 1977. Histopathology of carcinomas of liver in mice ingesting heptachlor/heptachlor epoxide. <i>Exp. Cell Biol.</i> 45:147-157. (Re-evaluation of the Davis (1965) study: Male and female C3H mice (100/sex/dose) were exposed to 0 or 10 ppm heptachlor epoxide for 2 years.)</li> <li>• IRDC. 1973. Eighteen-month Oral Carcinogenicity Study in Mice. Unpublished report to Velsicol Chemical Corp. As cited in Epstein, 1976. (Carcinogenicity of heptachlor and chlordane. <i>Sci. Tot. Environ.</i> 6:103-154.) (A 25:75 mix of heptachlor: heptachlor epoxide was fed to male and female CD-1 mice (100/sex/dose) for 18 months at 1, 5 or 10 ppm (0.13, 0.65 and 1.3 mg/kg per EPA, 1987, respectively.) (Epstein, S. S. 1976.</li> </ul> <p><b>Critical Effects:</b> From IRDC (1973) and Reuber (1977): The tumor incidences of hepatic carcinomas as diagnosed by the independent pathologists in males are 0/62, 2/68, 18/68 and 52/80 for the 0, 1, 5 and 10 ppm groups, respectively.</p> <p><b>POD:</b> The male mouse data from the IRDC (1973) study as reevaluated by Reuber (1977) were used for the quantitative cancer risk assessment for heptachlor epoxide. This study involved the administration of a 25:75 mixture of heptachlor: heptachlor epoxide. Since the primary metabolite of heptachlor is heptachlor epoxide, the resulting potency estimate of 3.6 (mg/kg/d)<sup>-1</sup> determined for the mixture is appropriate to use for the cancer assessment of heptachlor epoxide. This study was considered to be of better quality than the study by Davis (1965) because the IRDC data exhibited a strong dose-response relationship and this study did not have heavy mortality. EPA (2000) took the geometric mean from four data sets from the IRDC (1973) and Davis (1965) studies to derive a final q<sub>1</sub>* value of 9.1 (mg/kg/d)<sup>-1</sup>. According to Rule 57, the data set that results in the highest potency is normally used for criteria development. The data derived in the Davis (1965) study were not used to derive a slope factor even though they would have resulted in the highest potency because of the weaknesses described</p>		

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>above.</p> <p><b>California DTSC:</b> CSF= 5.5 (mg/kg-day)<sup>-1</sup>. Based on the IRDC (1973) dose related increase in the incidence of hepatocellular carcinomas in male and female CD-1 mice and the incidence of hepatocellular carcinomas in male and female C3H mice (Davis,1965). The estimate of potency is the mean CSF of 5.5 (mg/kgday)<sup>-1</sup>. <u>Calculation method:</u> The LED10 values ranged from 0.0071 to 0.089 mg/kg-day, the q1* values ranged from 0.58 to 20.9 (mg/kg-day)<sup>-1</sup> and the CSFs ranged from 1.1 to 18.5 (mg/kg-day)<sup>-1</sup>. The LED10 is the 95% lower confidence limit on the MLE10 dose. The geometric mean CSF value was 5.5 (mg/kg-day)<sup>-1</sup>. The difference between this new value and the U.S.EPA value is the interspecies scaling default of (body weight)<sup>3/4</sup> vs. the earlier (body weight)<sup>2/3</sup>. Key studies: - IRDC. 1973a. Unpublished report to Velsicol Chemical corporation, Eighteen Month Oral Carcinogenic Study in Mice, December 14. (Cited in Epstein, 1976), International Research and Development Corporation, Mattawan, MI. - Davis, H.J. 1965. Pathology report on mice fed aldrin, dieldrin, heptachlor or heptachlor epoxide for two years. Internal FDA memorandum to Dr. A.J. Lehman, July 19. (Cited in Epstein, 1976). <u>MOA:</u> There is no evidence or valid biological model supporting a threshold or non-linear approach for heptachlor or heptachlor epoxide or related chlorinated cyclodienes (OEHHA, 1997). Source: Public Health Goal for Heptachlor and Heptachlor Epoxide In Drinking Water, 1999</p> <p><b>Minnesota PCA:</b> CSF= 9.10E+0 (mg/kg-day)<sup>-1</sup> based on MDH Cancer HRL 1993, which was based on the CSF from IRIS 07/01/1993.</p> <p><b>New Jersey DEP:</b> CSF= 9.1 (mg/kg-day)<sup>-1</sup> based on IRIS.</p> <p><b>Texas CEQ:</b> CSF= 9.1E+0 (mg/kg-day)<sup>-1</sup> based on IRIS.</p>		



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<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 and New York, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), ECHA (REACH) and OECD HPV.		
<b>Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (<math>\mu\text{g}/\text{m}^3</math>)</b>	NA	NA	MDEQ, 2015	
<b>RfC/ITSL details</b>		<p><b>Tier 1 and 2 Sources:</b>  <b>IRIS 03/09/1991:</b> IRIS RfC not available at this time.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> ATSDR reports that available inhalation data are considered inadequate for the development of an inhalation MRL.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ:</b> Per DEQ-CCD, no AQD ITSL available at this time.</p>		Complete
<b>Inhalation Unit Risk Factor (IURF) (<math>(\mu\text{g}/\text{m}^3)^{-1}</math>)</b>	1.3E-3	2.6E-3	IRIS, 1993	
<b>IURF details</b>	11/30/1994; (AIR, AQD): IRSL obtained from EPA's IRIS. Inhalation unit risk was a conversion by EPA of the oral potency done by EPA. Oral potency is geometric mean	<p><b>Tier 1 Source:</b>  <b>IRIS:</b>  <b>Basis:</b> IRIS is the only available value. Inhalation Unit Risk of 2.6E-3 per (<math>\mu\text{g}/\text{m}^3</math>) was calculated from the oral data. See information on the IRIS oral CSF above.  <b>Carcinogen Weight-of-Evidence (WOE) Class:</b> B2 – probable human carcinogen.  <b>IRIS WOE Basis:</b> Sufficient evidence exists from rodent studies in which liver carcinomas were induced in two strains of mice of both sexes and in CFN female rats. Several structurally related compounds are liver carcinogens. IRIS, 7/1/1993.</p> <p><b>Tier 2 Sources:</b></p>		Complete

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
	of 4 mice studies, which found increased incidences of hepatocellular carcinomas. See IRIS.	<b>PPRTV:</b> No PPRTV record available at this time. <b>MRL:</b> NA; MRLs are for non-cancer effects only.  <b>Tier 3 Source:</b> <b>MDEQ-AQD:</b> No entry in DEQ-CCD by AQD. Per Bob Sills on 6/18/15, MDEQ/AQD has never generated an IUR for heptachlor epoxide.		
<b>Mutagenic Mode of Action (MMOA)? (Y/N)</b>	--	No	USEPA, 2015	
<b>MMOA Details</b>	--			
<b>Developmental or Reproductive Effector? (Y/N)</b>	No	No, the RfD is not based on a reproductive-developmental effect; however, there are such effects reported in the scientific literature.	MDEQ, 2015	
<b>Developmental or Reproductive Toxicity Details</b>	NA	NA		
<b>State Drinking Water Standard (SDWS) (µg/L)</b>	NA	0.2	SDWA, 1976	
<b>SDWS details</b>		MI Safe Drinking Water Act (SDWA) 1976 PA 399		
<b>Secondary Maximum Contaminant Level (SMCL) (µg/L)</b>	NA	NO	SDWA, 1976 and USEPA SMCL List	
<b>SMCL details</b>		MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
<b>Is there an aesthetic value for drinking water? (Y/N)</b>	No	Not evaluated.	NA	
<b>Aesthetic value details</b>	NA	NA		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
<b>Phytotoxicity Value? (Y/N)</b>	No	Not evaluated.	NA	
<b>Phytotoxicity details</b>	NA	NA		
<b>Others:</b>				

**(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, 2004	
ABS <sub>gi</sub> details		RAGS E (USEPA, 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> )		0.5	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>	ID
<b>Updated GSI value (µg/L)</b>	ID
<b>Rule 57 Drinking Water Value (µg/L)</b>	0.01 (M); 0.0021

	<b>Rule 57 Value (µg/L)</b>	<b>Verification Date</b>
<b>Human Non-cancer Values- Drinking water source (HNV-drink)</b>	0.0075	8/2000
<b>Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)</b>	0.0076	8/2000
<b>Wildlife Value (WV)</b>	NA	NA
<b>Human Cancer Values for Drinking Water Source (HCV-drink)</b>	0.0021	8/2000
<b>Human Cancer values for non-drinking water source (HCV-Non-drink)</b>	0.0021	8/2000
<b>Final Chronic Value (FCV)</b>	ID	8/2000
<b>Aquatic maximum value (AMV)</b>	ID	8/2000
<b>Final Acute Value (FAV)</b>	ID	8/2000

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>	20	MDEQ, 2015
<b>Target Detection Limit – Water (<math>\mu\text{g}/\text{L}</math>)</b>	0.01	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 OEHHHA	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