



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Naphthalene
CAS #:	91-20-3
Revised by:	RRD Toxicology Unit
Revision Date:	September 16, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	128.17	128.18	EPI	EXP
Physical State at ambient temp	Solid	Solid	MDEQ	
Melting Point (°C)	---	80.20	EPI	EXP
Boiling Point (°C)	217.9	217.90	EPI	EXP
Solubility (ug/L)	31000	31000	EPI	EXP
Vapor Pressure (mmHg at 25°C)	0.0912	8.50E-02	EPI	EXP
HLC (atm-m³/mol at 25°C)	4.83E-4	4.40E-04	EPI	EXP
Log Kow (log P; octanol-water)	3.36	3.30	EPI	EXP
Koc (organic carbon; L/Kg)	2010	1544	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm²/s)	0.059	6.05E-02	W9	EST
Diffusivity in Water (Dw; cm²/s)	7.5E-6	8.38E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	174 F	79	CRC	EXP
Lower Explosivity Level (LEL; unitless)	0.009	0.009	CRC	EXP
Critical Temperature (K)		7.48E+02	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		1.04E+04	EPA2004	EXP
Density (g/mL, g/cm ³)		1.0253	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	9.76E-06	1.72E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	9.88E-06	2.09E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	1.18E-05	2.39E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	1.18E-05	2.65E-05	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	7.1E-2	1.0E-1	OPP, 2008	
RfD details	<p>Critical effect: decreased body weight gain in male rats administered via gavage for 13 weeks, 5 of 7 days. NOAEL = 71 mg/Kg/day (duration adjusted due to dosing 5 of 7 days/week). UF = 1000 (IRIS used an UF of 3000, that is, an extra 3-fold UF to account for lack of chronic oral studies and 2-generation reproductive studies). Calculation date: 3/17/2000</p>	<p>Tier 1 Source: EPA-OPP: Basis: OPP-RED (2008) RfD = 1.0E-1 mg/kg-day. IRIS indicated that it does not currently develop updated assessments for registered pesticides. Per IRIS, the “user should consult OPP Reregistration Eligibility Decision (RED) documents prepared by the Office of Pesticide Programs for additional health assessment information.” Both IRIS and the OPP-RED RfDs are based on the same 90 day rat study. The difference lies with the UFs. IRIS uses an UF of 3000 and the RED RfD is based on an UF of 1000. IRIS uses a UF of 3 for database deficiencies and RED uses a UF of 1. OPP RfD = 1E-1 mg/kg/day. Critical Study: NTP 90-Day Study in the Rat (1980). [Subchronic Toxicity Study: Naphthalene (C52904), Fischer 344 rats. Battelle's Columbus Laboratories, Columbus, OH. Report to the U.S. Department of Health and Human Services, National Toxicology Program.] Critical effect or POD: NOAEL = 100 mg/kg/day. LOAEL = 200 mg/kg-day, based on decreased body weights/body weight gains. Comments on Study/Endpoint/Uncertainty Factors: The endpoint is based on the most sensitive effect noted in the subchronic oral rat study. The study is supported by the NTP subchronic oral mouse study that indicated a clear NOAEL of 100 mg/kg/day. Uncertainty Factor (UF): An UF of 1000 was applied to account for extrapolation from subchronic to chronic toxicity studies (10x), interspecies extrapolation (10x) and intraspecies variations (10x). This composite factor of 1000 also addresses the lack of a reproductive toxicity study for this nonfood use pesticide. $\text{Chronic RfD} = \frac{100 \text{ mg/kg/day (NOAEL)}}{1000(\text{UF})} = 0.10 \text{ mg/kg/day}$</p>		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>“Naphthalene: HED Chapter for the Reregistration Eligibility Decision Document (RED)” August 22, 2008.</p> <p>Tier 1 and Sources: IRIS 09/17/1998: RfD = 2E-2 mg/kg/day. Critical Study: Battelle's Columbus Laboratories (BCL). (1980a) Unpublished subchronic toxicity study: Naphthalene (C52904), Fischer 344 rats. Prepared by Battelle Laboratories under NTP Subcontract No. 76-34-106002. Available from the Center for Environmental Research Information, (202)566-1676. Methods: Naphthalene (> 99% pure) in corn oil was administered by gavage to groups of 10 male and 10 female Fischer 344 rats at dose levels of 0, 25, 50, 100, 200, or 400 mg/kg (duration-adjusted 0, 17.9, 35.7, 71.4, 142.9, and 285.7 mg/kg-day), 5 days/week for 13 weeks (BCL, 1980a). Critical effect: Decreased mean terminal body weights in males. End point or Point of Departure (POD): NOAEL = 100 mg/kg-day; adjusted = 71 mg/kg/day. Uncertainty Factors: UF = 3000: 10 to extrapolate from rats to humans, 10 to protect sensitive humans, 10 to extrapolate from subchronic to chronic exposure, and 3 for database deficiencies including the lack of chronic oral exposure studies and 2-generation reproductive toxicity studies. Source and date: IRIS 09/17/1998. IRIS selected over RED Document because the RfD was derived from a dose that was adjusted for the 5 day dosing week – the RED document does not include this adjustment. The MRL was not used as this was a developmental study (9 days) with no developmental effects and the resulting RfD was higher.</p> <p>PPRTV: No PPRTV record available at this time.</p> <p>MRL: Per ATSDR, final oral acute MRL = 0.6 mg/kg/day; UF = 90; neurological effects; 09/2005. Final oral int. MRL = 0.6 mg/kg/day; UF = 90; neurological effects; 09/2005. The intermediate oral MRL = 0.6 mg/kg/day and is based</p>		

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>on NTP, 1991. Developmental toxicity of naphthalene administered by gavage to Sprague-Dawley (CD) rats on gestational days 6-15. Research Triangle Park, NC: National Toxicology Program, National Institute of Environmental Health Sciences, US Dept. of Health and Human Services, PHS, NIH. TER91066. Groups of 25–26 pregnant female Sprague-Dawley rats received doses of 0, 50, 150, and 450 mg/kg/day by gavage on gestation days 6–15. There were two replicate groups of 12–13 animals. A minimal LOAEL of 50 mg/kg/day for transient clinical signs of toxicity in pregnant rat dams. UF = 90 (3 for LOAEL; 10 for extrapolation from animals to humans and 3 for human variability.) No oral chronic MRL is available.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD-WRD 01/07/2010: RfD = 7.1E-2 mg/kg/day. NOAEL of 100 mg/kg (71 mg/kg/d) in male and female F344 rats dosed by gavage 5 days/week for 13 weeks (UF=1000) (Batelle Columbus Laboratories (1980)).</p>		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	NA	NA	MDEQ, 2015	
CSF details	--	<p>Carcinogen Weight-of-Evidence (WOE) Class: Using the 1996 Proposed Guidelines for carcinogen risk assessment, the human carcinogenic potential of naphthalene via the oral or inhalation routes “cannot be determined” at this time based on human and animal data. IRIS 09/17/1998.</p> <p>IRIS WOE Basis: An oral slope factor for naphthalene was not derived because of a lack of chronic oral naphthalene studies.</p> <p>Tier 1 and 2 Sources: IRIS, 1998: An oral slope factor for naphthalene was not derived because of a lack of chronic oral naphthalene studies. PPRTV: No PPRTV record available at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Sources:</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		MDEQ: Per DEQ-CCD-WRD 01/07/2010 NA.		
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) ($\mu\text{g}/\text{m}^3$)	3.0	3.0	IRIS, 1998	
RfC/ITSL details	EPA RfC	<p>Tier 1 Sources: IRIS: Basis: IRIS is a Tier 1 source. Critical Study: National Toxicology Program (NTP). (1992a) Toxicology and carcinogenesis studies of naphthalene in B6C3F1 mice (inhalation studies). Technical Report Series No. 410. NIH Publication No. 92-3141. Methods: B6C3F1 mice (75/sex/group) were exposed to naphthalene (scintillation grade, > 99% pure) at target concentrations of 0, 10, and 30 ppm (0, 52, 157 mg/m^3) for 6 hr. /day, 5 days/week, for 103 weeks (NTP, 1992a). The duration-adjusted levels were 0, 9.3, and 28 mg/m^3, respectively. Additional groups of 75 male and 75 female replacement animals were exposed to 30 ppm to ensure that a sufficient number of mice lived to study termination. Naphthalene vapor was generated by direct sublimation and monitored by a software feedback arrangement. Critical effect: Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively. End point or Point of Departure (POD): LOAEL (HEC) = 9.3E+3 ug/m^3 Uncertainty Factors: UF = 3000 (10 for extrapolation to humans; 10 to protect sensitive humans; 10 to extrapolate to a NOAEL; 3 for database deficiencies including the lack of a 2 generation reproductive study and chronic inhalation data for other animal species. Source: IRIS, 9/17/1998</p> <p>Tier 1 and 2 Sources: EPA-OPP: RED Document, August 22, 2008: This document does not include</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>derivation of inhalation quantitative estimates.</p> <p>PPRTV: No PPRTV record available at this time.</p> <p>MRL: Final inhalation chronic MRL = 0.0007 ppm (7E+1 ug/m³); UF = 300; Respiratory effects; 09/2005.</p> <p>METHODS: NTP 1992a: Groups of 75 B6C3F1 mice of each sex were exposed by inhalation at concentrations of 0, 10, or 30 ppm. Exposure occurred 5 times/week, 6 hours/day for 104 weeks.</p> <p>Abdo et al. 2001; NTP 2000: Groups of 49 male and 49 female F344/N rats were exposed to naphthalene at concentrations of 0, 10, 30, or 60 ppm for 6 hours/day, 5 days/week for 105 weeks.</p> <p>CRITICAL EFFECT AND POD: The lowest exposure level in both studies, 10 ppm, was a LOAEL in both sexes of both species for nonneoplastic lesions in nasal olfactory epithelium and respiratory epithelium. Applying EPA inhalation dosimetry (see below), a human equivalent LOAEL of 0.2 ppm, based on the rat LOAEL, was selected as the point of departure for the chronic inhalation MRL. Benchmark dose analyses were not conducted on the incidence data for nonneoplastic nasal lesions, because the data provided insufficient information on the shape of the dose-response relationship. The lowest exposure level in the principal study induced nasal lesions in essentially all of the rats.</p> <p>UNCERTAINTY FACTORS: UF = 300: 10 for use of a LOAEL; 3 for extrapolation to humans with dosimetric adjustment; 10 for sensitive individuals.</p> <p>AQD determined (5-22-2015) that ATSDR MRL was inappropriate because they used EPA's old methodology for determining the dosimetric adjustment factor (DAF) for calculating the human equivalent concentration (HEC). EPA used a database deficiency factor whereas ATSDR did not. Ultimately the final numbers were almost identical and because of the inappropriate DAF used by ATSDR, AQD maintains the ITSL based on the IRIS RfC. (See email</p>		



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		dated 5/22/2015 in the tox assessment folder for naphthalene.) Tier 3 Source: MDEQ: Per DEQ-CCD-AQD 9/17/1998. ITSL = 3 ug/m ³ (annual) based on EPA's RfC. The RfC is based on a chronic mouse LOAEL of 10 ppm reported by NTP (1992). The critical effects were hyperplasia and metaplasia of respiratory and olfactory epithelium. See IRIS. In 2014, the chronic ITSL averaging time was changed from 24-hr. to annual. Also, an acute ITSL was established based on the TLV of 52 mg/m ³ .		
Inhalation Unit Risk Factor (IURF) ((µg/m³)⁻¹)	3.1E-6	3.4E-5	CALEPA, 2011	
IURF details	AQD: SRSL based on NTP 2-yr. inhalation rat study	<p>Tier 3 Source: CALEPA: Basis: CALEPA (2011) value based on the tumor incidence in male rats. Tumor data from NTP (1992, 2000) inhalation carcinogenesis studies were used with more current models to derive several unit risk values. Minnesota and New Jersey adopted the CALEPA value. MDEQ (2004) derived their value using the NTP 2000 study. See details below.</p> <p>Tier 1 Sources: IRIS 09/17/1998: An inhalation unit risk estimate for naphthalene was not derived because of the weakness of the evidence (observations of predominant benign respiratory tumors in mice at high dose only) that naphthalene may be carcinogenic in humans.</p> <p>EPA-OPP RED Document: Phase 4 Amendment: Response to Comments in Reference to "Naphthalene: HED Chapter for the Reregistration Eligibility Decision Document (RED)" August 22, 2008. No quantitative assessments of the cancer data were conducted in this document.</p> <p>Tier 2 Sources:</p>		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>PPRTV: No PPRTV record available at this time. MRLs: Not available; for noncancer effects.</p> <p>Tier 3 Sources: MDEQ-AQD, 10/25/2004: Per DEQ-CCD-AQD (10/25/2004) IURF = 1.2E-5 ug/m³. Annual AT. Critical Study: NTP 2000. Toxicology and Carcinogenesis Studies of Naphthalene in F344/N Rats (Inhalation Studies). NTP TR 500 NIH Publication No. 01-4434. Methods: Groups of 49 male and female rats were exposed to naphthalene at concentrations of 0, 10, 30 or 60 ppm for 6 hours plus 12 minutes per day, 5 days per week for 105 weeks. Carcinogen Weight-of-Evidence (WOE) Class: NA from IRIS as the 1998 determination was made prior to the publication of the above study IRIS WOE Basis: IURF based on NTP inhalation rat study on naphthalene (December, 2000). Under the conditions of the 2-year inhalation study, there was clear evidence of carcinogenic activity of naphthalene in male and female F344/N rats based on increased incidences of respiratory epithelial adenoma and olfactory epithelial neuroblastoma of the nose. Combined incidence: 0/49, 6/48, 11/48, 18/49 for the control, 10, 30, 60 ppm. The exposure doses were adjusted using 5.24 mg/m³/ppm and 6/24 x 5/7 to obtain 0, 9360, 28100, 56100 ug/m³.</p> <p>California DTCS (CALEPA): IURF= 3.4E-05 (µg/m³)⁻¹. Key studies: NTP (1992, 2000) inhalation carcinogenesis studies Tumor types: mouse lung alveolar/bronchiolar adenoma or carcinoma, rat nasal respiratory epithelial adenoma and nasal olfactory epithelial neuroblastoma Method: Male and female rats (NTP, 2000) were exposed by inhalation for 6.2 hrs. /day, 5 days/wk. for 105 weeks. Female mice (NTP 1992) were exposed 6 hrs. /day, 5 days/wk. for 104 weeks. Average concentrations were</p>		



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		<p>calculated by multiplying the reported chamber concentrations by 6 or 6.2 hours/24 hrs. 5 days/7 days and 5.24 mg/m³/ppm. The average body weight (BW) of female mice was 0.029 kg based on data for controls reported by NTP (1992). The average BW of male and female rats were 0.445 kg and 0.258 kg, respectively, based on data for controls reported by NTP (2000). Breathing rates were 0.038 m³/day for female mice, 0.262 m³/day for male rats, and 0.182 m³/day for female rats. Lifetime average doses were determined by multiplying the concentrations during the dosing period by the animal breathing rate divided by the corresponding animal BW. Using either the multistage polynomial, or quantal linear model, the 95% upper confidence bound on the unit risk value is in the range 0.014-0.034 (mg/m³)-1, based on the incidence data in female mice and male and female rats. The male rat was the most sensitive sex and species in the NTP. The increased incidences of nasal respiratory epithelial adenoma and nasal olfactory epithelial neuroblastoma, which are rare tumors, provide clear evidence of the carcinogenic activity of naphthalene. The unit risk value is 0.034 (mg/m³)-1, or 3.4 x 10⁻⁵ (µg/m³)-1, based on the tumor incidence data in male rats.</p> <p>Source: Appendix B. Chemical-specific summaries of the information used to derive unit risk and cancer potency values. updated 2011; p409-431</p> <p>Minnesota PCA: IURF= 3.40E-05 (µg/m³)⁻¹ based on CAL EPA .</p> <p>Texas CEQ: IURF= 3.40E-05 (µg/m³)⁻¹ based on CAL EPA.</p> <p>Other Tier 3: 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.</p>		
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2014	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	--	No, the RfD or RfC/ITSL is not based on a reproductive-developmental effect.	MDEQ, 2014	
Developmental or Reproductive Toxicity Details	--	NA		
State Drinking Water Standard (SDWS) (µg/L)	--	NO	SDWA, 1976	
SDWS details	--	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (µg/L)	--	NO	SDWA, 1976 and USEPA SMCL List	
SMCL details	--	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
Is there an Aesthetic Value? (Y/N)	--	Not evaluated.	NA	
Aesthetic value details	--	NA		
Is there a Phytotoxicity Value? (Y/N)	--	Not evaluated.	NA	
Phytotoxicity details	--	NA		
Others:				

(C) Chemical-specific Absorption Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS _{gi})	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABS _{gi} details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE _d)	---	0.1	MDEQ, 2015	
AE _d details				
Ingestion Absorption Efficiency (AE _i)		1.0	MDEQ, 2015	
AE _i Details				
Relative Source Contribution for Water (RSC _w)		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC _s)		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC _A)		1.0	MDEQ, 2015	
Others				

(D) Rule 57 Water Quality Values and GSI Criteria

Current GSI value (µg/L)	11
Updated GSI value (µg/L)	11
Rule 57 Drinking Water Value (µg/L)	1,100

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	1,100	1/2010
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	2,300	1/2010
Wildlife Value (WV)	NA	NA
Human Cancer Values for Drinking Water Source (HCV-drink)	NA	NA
Human Cancer values for non-drinking water source (HCV-Non-drink)	NA	NA
Final Chronic Value (FCV)	11	2/2008
Aquatic maximum value (AMV)	100	2/2008
Final Acute Value (FAV)	200	2/2008

Sources:

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

(E) Target Detection Limits (TDL)

	Value	Source
Target Detection Limit – Soil ($\mu\text{g}/\text{kg}$)	330	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	5	MDEQ, 2015
Target Detection Limit – Air (ppbv)	4.10E-01	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	1.40E+01	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