CHEMICAL UPDATE WORKSHEET

Chemical Name:	**trans-1,2-Dichloroethylene**
CAS #:	**156-60-5**
Revised By:	RRD Toxicology Unit
Revision Date:	August 17, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	96.94	96.94	EPI	EXP
Physical State at ambient temp	Liquid	Liquid	MDEQ	
Melting Point (˚C)	223	-49.8	PP	EXP
Boiling Point (˚C)	48.7	48.7	PP	EXP
Solubility (ug/L)	6.30E+6	4.520E+06	PP	EXP
Vapor Pressure (mmHg at 25˚C)	349.6	3.31E+02	PP	EXT
HLC (atm-m^3/mol at 25˚C)	9.38E-3	9.38E-03	PP	EXP
Log Kow (log P; octanol-water)	2.07	2.09	PP	EXP
Koc (organic carbon; L/Kg)	52.2	52.5	SSG	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	0.0707	8.76E-02	W9	EST
Diffusivity in Water (Dw; cm^2/s)	1.19E-5	1.1191E-05	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (˚C)	36 F	2	CRC	EXP
Lower Explosivity Level (LEL; unitless)	0.056	0.06	CRC	EXP
Critical Temperature (K)		5.17E+02	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		6.72E+03	EPA2004	EXP
Density (g/mL, g/cm^3)		1.2565	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm^2)	2.65E-05	2.79E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm^2)	6.26E-05	6.78E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	3.75E-05	4.44E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	8.79E-05	1.07E-04	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	1.7E-2	2.0E-2	IRIS, 2010	
RfD details	Mouse subchronic (90-day) drinking water study (Barnes et al., 1985); NOAEL = 17 mg/kg/day; UF = 1000; Critical effect = increased serum alkaline phosphatase. *IRIS oral RfD adjusted to two significant figures. SUBCHRONIC RfD: Value is based on mixed isomers. Values derived for 1, 1-Dichloroethylene was adopted for 1, and 2-Dichloroethylene mixed isomers based on analogy. Source: IRIS. CCD/RRD date: 4/20/1988	**Tier 1 Source:** **IRIS:** **Basis:** IRIS is a Tier 1 source. **IRIS** chronic RfD = 2.0E-2 mg/kg-day: **Critical Study**: Shopp, GM, Jr; Sanders, VM; White, KL, Jr; et al. (1985) Humoral and cell-mediated immune status of mice exposed to trans-1, 2-dichloroethylene. Drug Chem Toxicol 8:393–407. **Methods**: CD-1 mice (10/sex/group) were exposed to trans-1, 2-DCE at concentrations of 0.1, 1.0, and 2.0 mg/mL in drinking water containing 1% emulphor for 90 days. The equivalent doses are 17, 175, and 387 mg/kg-day in male mice and 23, 224, 452 mg/kg-day in female mice. **Critical effect**: Decreased number of antibody forming cells (AFCs) against sheep red blood cells (sRBCs) in male mice **End point or Point of Departure (POD):** $BMDL_{1SD}$ = 65 mg/kg-day **Uncertainty Factors**: UF = 3,000 (10 each for intraspecies variability, interspecies extrapolation and use of a subchronic study, and 3 for database deficiencies) **Source and date:** IRIS, RfD Last revision date - 9/30/2010. An IRIS Toxicological Review is available. **Tier 2 Sources:** **PPRTV:** No PPRTV record available at this time. A PPRTV (5/31/2002) is available for mixed 1, 2-Dichloroethylene isomers. **MRL:** Per ATSDR (8/1996), no oral chronic MRL at this time. Oral intermediate MRL = 0.2 mg/kg day was derived: **Critical Study**: Barnes DW, Sanders VM, White KL Jr, Shopp GM, and Munson AE. 1985. Toxicology of trans-1, 2-Dichloroethylene in the Mouse. Drug and Chemical Toxicology 8(5):373-392. **Methods**: mice (control group – 260/sex) and (treated group -140/sex) were exposed to 0.1, 1.0, or 2.0 mg trans-1,2-dichlorethene/mL drinking water with		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		(males: 0, 17, 175, 387 mg/kg/day; females: 0,23, 224,452 mg/kg/day). **Critical effect**: increased serum alkaline phosphatase **End point or Point of Departure (POD):** NOAEL = 17 mg/kg/day **Uncertainty Factors**: UF = 100 (10 each for intraspecies variability and interspecies extrapolation) **Source and date:** ATSDR, 8/1996 **Tier 3 Source:** **MDEQ:** 1) Per DEQ-CCD/RRD (4/20/1988), RfD = 1.7E-2 mg/kg-day. See Part 201 Value RfD details. 2) Per DEQ-CCD/RRD (5/9/2008), RfD = 1.7E-2 mg/kg-day based on a NOAEL of 0.1 mg/mL (17 mg/kg-day) in male CD-1 mice dosed via the drinking water for 90 days (UF=1000) (Barnes, 1985).		
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	--	NA	MDEQ, 2015	
CSF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate to assess the carcinogenic potential" **IRIS WOE Basis**: absence of epidemiological studies in humans and lack of animal studies **Source and Date**: IRIS, 9/30/2010 **Tier 1 and 2 Sources:** **IRIS:** Per IRIS (9/30/2010), no value at this time. **PPRTV:** No PPRTV record available at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		Complete
Reference Concentration (RfC) or Initial	7.0E+1	8.0E+1	ATSDR, 1996/MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Threshold Screening Level (ITSL) (µg/m³)				
RfC/ITSL details	The ITSL was based on the RfD of 0.02 mg/kg. The critical effect was identified as increased serum alkaline phosphotase in male mice at 175 mg/kg. The NOAEL was identified as 17 mg/kg/day. An uncertainty factor of 1000 was applied: 10 each for laboratory animals to humans, sensitive humans, and subchronic to chronic exposure. Source: EPA Entry date: 4/20/98	**Tier 2 Source:** **ATSDR:** **Basis:** ATSDR is a Tier 2 source, no Tier 1 available. Intermediate inhalation MRL of 7.9E-1 mg/m³ was applied an additional UF = 10 by MDEQ (3 each for subchronic to chronic extrapolation and database deficiency) to derive a chronic inhalation MRL = 8.0E-2 mg/m³. The MDEQ/AQD ITSL value (7.0E+1 µg/m³) is based on the IRIS RfD of 0.02 mg/kg-day. **MRL:** Per ATSDR, no inhalation chronic MRL value at this time. Inhalation intermediate MRL = 0.2 ppm (0.79 mg/m³) was derived as follows: **Critical Study**: Freundt, KI, Liebaldt, GP, and Lieberwirth, E. 1977. Toxicity Studies on Trans-1, 2-Dichloroethylene. Toxicology, 7, pp. 141-153. **Methods**: Female, mature SPF Wistar rats (6/group) were exposed 5 days per week, for either 8 or 16 weeks, at or 200 ppm of trans-1,2-dichloroethene by inhalation. **Critical effect**: fatty degeneration of liver cells **End point or Point of Departure (POD):** LOAEL = 200 ppm **Uncertainty Factors**: UF = 1,000 (10 each for intraspecies variability, interspecies extrapolation and LOAEL to NOAEL extrapolation) **Source and date:** ATSDR, 8/1996 **Tier 1 and 2 Sources:** **IRIS:** Per IRIS (9/30/2010), no value at this time. **PPRTV:** No PPRTV record available at this time. **Tier 3 Source:** **MDEQ:** Per MDEQ-CCD/AQD, the updated ITSL = 7.0E+1 µg/m³. The value is based on the 9/30/2010 IRIS RfD of 0.02 mg/kg-day : **Critical Study**: Shopp, GM, Jr; Sanders, VM; White, KL, Jr; et al. (1985) Humoral and cell-mediated immune status of mice exposed to trans-1, 2-dichloroethylene. Drug Chem Toxicol 8:393–407.		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Method(s): CD-1 mice (10/sex/group) were exposed to trans-1, 2-DCE at concentrations of 0.1, 1.0, and 2.0 mg/mL in drinking water containing 1% emulphor for 90 days. The equivalent doses are 17, 175, and 387 mg/kg-day in male mice and 23, 224, 452 mg/kg-day in female mice. **Critical effect**: Decreased number of antibody forming cells (AFCs) against sheep red blood cells (sRBCs) in male mice **End point or Point of Departure (POD):** $BMDL_{1SD}$ = 65 mg/kg-day **Uncertainty Factors**: UF = 3,000 (10 each for intraspecies variability, interspecies extrapolation and use of a subchronic study, and 3 for database deficiencies) **Source and Date**: MDEQ-CCD/AQD, 9/30/2010		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate to assess the carcinogenic potential" **IRIS WOE Basis**: absence of epidemiological studies in humans and lack of animal studies **Source and Date**: IRIS, 9/30/2010 **Tire 1 and 2 Sources:** **IRIS:** Per IRIS (9/30/2010), no value at this time. **PPRTV:** No PPRTV record available at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		Complete
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	EPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive	No	No. The RfD or ITSL is not based on a reproductive-developmental effect.	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Effector? (Y/N)				
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	1.0E+2	1.0E+2	SDWA, 1976	
SDWS details	SDWA, 1976	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NO	SDWA, 1976 and USEPA SMCL List	
SMCL details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
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		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA		
Others	--	--	NA	

(C) Chemical-specific Exposure Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABSgi)	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABSgi details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AEd)	---	0.1	MDEQ, 2015	
AEd details				
Ingestion Absorption Efficiency (AEi)		1.0	MDEQ, 2015	
AEi 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)	1,500 (X)
Updated GSI value (µg/L)	1,500 (X)
Rule 57 Drinking Water Value (µg/L)	470

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	470	9/2008
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	19,000	9/2008
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)	1,500	7/2000
Aquatic maximum value (AMV)	14,000	7/2000
Final Acute Value (FAV)	28,000	7/2000

Sources:
1. MDEQ Surface Water Assessment Section Rule 57 website
2. MDEQ Rule 57 table

(E) Analytical Information

	Value	Source
Target Detection Limit – Soil (μg/kg)	50	MDEQ, 2015
Target Detection Limit – Water (μg/L)	1	MDEQ, 2015
Target Detection Limit – Air (ppbv)	1.70E+01	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	5.80E+02	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