CHEMICAL UPDATE WORKSHEET

Chemical Name:	**1,1-Dichloroethane**
CAS #:	**75-34-3**
Revised By:	RRD Toxicology Unit
Revision Date:	September 24, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	98.96	98.96	EPI	EXP
Physical State at ambient temp	Liquid	Liquid	MDEQ	
Melting Point (˚C)	---	-96.90	EPI	EXP
Boiling Point (˚C)	57.4	57.40	EPI	EXP
Solubility (ug/L)	5.06E+6	5.040E+06	EPI	EXP
Vapor Pressure (mmHg at 25˚C)	228	2.27E+02	EPI	EXP
HLC (atm-m^3/mol at 25˚C)	5.62E-3	5.62E-03	EPI	EXP
Log Kow (log P; octanol-water)	1.79	1.79	EPI	EXP
Koc (organic carbon; L/Kg)	31.3	31.82	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	0.0742	8.36E-02	W9	EST
Diffusivity in Water (Dw; cm^2/s)	1.05E-5	1.0621E-05	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (˚C)	2.0 F	-17	CRC	EXP
Lower Explosivity Level (LEL; unit less)	0.054	0.054	CRC	EXP
Critical Temperature (K)		5.23E+02	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		6.90E+03	EPA2004	EXP
Density (g/mL, g/cm^3)		1.1757	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)	6.31E-05	6.75E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	3.77E-05	4.43E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	8.87E-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)	1.2E-1	2.0E-1	PPRTV, 2006	
RfD details	Rat subchronic inhalation toxicity study (Hofmann et al., 1971); Route-to-route extrapolation. Critical effects = no effects observed @ air concentration of 500 ppm ---> 115 mg/kg/day. UF = 1000; HEAST oral RfD adjusted to two significant figures. Based on route to route extrapolation. CCD-RD date: 3/1/1992.	**Tier 2 Source:** **PPRTV:** **Basis:** PPRTV is a Tier 2 source. No Tier 1 value. **PPRTV** p-RfD = 0.2 (2.0E-1) mg/kg-day **Critical Study**: Muralidhara, S., R. Ramanathan, S.M. Mehta et al. 2001. Acute, subacute, and subchronic oral toxicity of 1,1-dichloroethane in rats: application to risk evaluation. Toxicol. Sci. 64: 134-145. **Methods**: Male Sprague-Dawley rats (15/dose) were dosed with 0, 500, 1000, 2000, or 4000 mg/kg-day 1,1-dichloroethane by gavage, 5 days/week for 13 weeks. **Critical effect**: increased urinary enzyme markers for renal damage and CNS depression **End point or Point of Departure (POD):** $NOAEL_{ADJ}$ = 714.3 mg/kg-day (NOAEL = 1000 mg/kg-day, administered for 5 days/week, is adjusted to 714.3 mg/kg-day for continuous exposure). **Uncertainty Factors**: UF = 3,000 (10 each for interspecies extrapolation, intraspecies variability, and use of subchronic study and 3 for database deficiencies **Source and date:** PPRTV, 9/27/2006 **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (10/01/1991), no value at this time. **MRL:** Per ATSDR MRL List April 2015, no oral MRL at this time. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD/WRD (9/21/2011), A NOAEL of 500 mg/kg bwt/d was found in a study that dosed male Sprague-Dawley rats via gavage 7 days/week for 90 days (UF=1000)(Muralidhara et al., 2001).		Complete
Oral Cancer Slope Factor (CSF)	--	NA	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
(mg/kg-day)$^{-1}$)				
CSF details		**Carcinogen Weight-of-Evidence (WOE) Class**: *suggestive evidence of carcinogenic potential* (PPRTV, 2006); C, possible carcinogen (IRIS, 1996) **IRIS WOE Basis**: Per IRIS (12/01/1996): absence of human data and limited evidence in rats and mice **Source and Date**: PPRTV - 9/27/2006; IRIS - 12/01/1996. A September 2002 IRIS screening level review did not identify any critical new studies. **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (12/01/1996), no value at this time. **PPRTV:** Per PPRTV (9/27/2006), no value 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 Threshold Screening Level (ITSL) (µg/m³)	5.0E+2	5.0E+2	MDEQ, 1997	
RfC/ITSL details	The RfC was based on a 13 week inhalation study (Hoffman et al., 1971) that was translated from the German by the USEPA Health Effects Assessment for 1,1-DCE (EPA,	**Tier 3 Source:** **MDEQ:** **Basis:** MDEQ selected as the best available value. The study upon which the value is based is also reported in HEAST (1997) and NY DEC. Details for CA and TX were not provided on-line and were not pursued further due to the schedule. See details below. **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (12/01/1996), no value at this time. **PPRTV:** Per PPRTV (9/27/2006), no value at this time. Hofmann et al. (1971) identified renal effects in the cat as the most sensitive species for 1,1-		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
	1984). The LOAEL was 4050 µg/m3 for 26 weeks where increased BUN and abnormal kidney histopathology was noted in cats but not in the 4 other species tested. The NOAEL was 2025 µg/m3 and the duration adjusted NOAEL was 138 mg/kg/day, based on an inhalation rate in the cat of 1.26 m^3/day and a cat body weight of 3.3 kg. An uncertainty factor of 1000 was used. Source: CCD- AQD date: 8/25/1997	dichloroethane in a subchronic study. However, the data are inadequate to identify the 500 ppm level as either a LOAEL or a NOAEL. No effects on the kidneys or other organs were found in other species tested in this study or in other repeated exposure inhalation studies (Dow Chemical, 1990; AIHA, 1986; Union Carbide, 1947). **MRL:** Per ATSDR April 2015 list, no MRL at this time. **Tier 3 Sources:** **MDEQ: DEQ-**CCD/AQD (1997) ITSL = 5.0E+2 µg/m^3: Averaging time = 24 hours. **Critical Study**: Hofmann, H.T., H. Birnstiel and P. Jobst. 1971. Inhalation toxicity of 1,1- and 1,2-dichloroethane. Arch. Toxicol. 27: 248-265. **Methods**: Sprague-Dawley rats, Pirbright-White guinea pigs, "colored" rabbits and cats were exposed to 0 or 500 ppm of 1,1-dichloroethane (2024 mg/m^3) for 6 hours/day, 5 days/week for 13 weeks. Each species was composed of an equal number of males and females (2 each for cats and rabbits, 5 each for guinea pigs and rats). **Critical effect**: increased BUN and abnormal kidney histopathology **End point or Point of Departure (POD):** NOAEL = 2025 µg/m^3; duration adjusted NOAEL = 138 mg/kg/day (based on a cat inhalation rate and body weight of 1.26 m^3/day and 3.3 kg, respectively). **Uncertainty Factors**: UF = 1,000 (10 each for intraspecies variability, interspecies extrapolation and use of a subchronic study) **Source and date:** DEQ-CCD/AQD, 8/25/1997 **HEAST:** RfC= 5E-1 µg/m^3 based on HEAST Summary, 1997. **California DTSC:** RfC= 8.0E+02 µg/m^3 based on RfD and route extrapolation. **New York DEC:** RfC= 500 µg/m^3 based on a POD of 5E+5 µg/m^3 (NOEL) and UF = 1000. Based on kidney damage in cats exposed by inhalation six hours/d, 5 d/wk for 13 wks. Study LOEL = 1E+6 µg/m^3. (USEPA HEAST, 1997)		

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Texas CEQ: RfC= 2.4E+00 µg/m³. Value derived by TCEQ – details not provided on-line. Not pursued further at this time due to schedule. **Other Tier 3:** No value is available at this time from these Tier 3 sources/databases: NTP ROC, health and environmental agencies of Massachusetts, Minnesota and New Jersey, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), ECHA (REACH) and OECD HPV.		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: *suggestive evidence of carcinogenic potential* (PPRTV, 2006); C, possible carcinogen (IRIS, 1996) **IRIS WOE Basis**: Per IRIS (12/01/1996): absence of human data and limited evidence in rats and mice **Source and Date**: PPRTV - 9/7/2006; IRIS - 12/01/1996. A September 2002 IRIS screening level review did not identify any critical new studies. **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (12/01/1996), no value at this time. **PPRTV:** Per PPRTV (9/27/2006), no value 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	USEPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	No	No, the RfD or RfC/ITSL is not based on a reproductive-developmental effect.	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	--	NO	SDWA, 1976	
SDWS details	NA	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		
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 (ABSgi)	---	1.0	MDEQ, 2015/USEPA RAGS-E	
ABSgi details		RAGS E (EPA, 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)	740
Updated GSI value (µg/L)	740
Rule 57 Drinking Water Value (µg/L)	9,800

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	9,800	11/2011
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	400,000	11/2011
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)	740	11/2011
Aquatic maximum value (AMV)	6,600	11/2011
Final Acute Value (FAV)	13,000	11/2011

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 (μg/kg)	50	MDEQ, 2015
Target Detection Limit – Water (μg/L)	1	MDEQ, 2015
Target Detection Limit – Air (ppbv)	1.20E+02	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	4.10E+03	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