



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Chloroethane (DD)
CAS #:	75-00-3
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)	64.52	64.52	EPI	EXP
Physical State at ambient temp	Liquid	Gas	MDEQ	
Melting Point (°C)	---	-138.70	EPI	EXP
Boiling Point (°C)	12.3	12.30	EPI	EXP
Solubility (ug/L)	5.74E+6	6.710E+06	EPI	EXP
Vapor Pressure (mmHg at 25°C)	1000	1.01E+03	EPI	EXP
HLC (atm-m ³ /mol at 25°C)	8.80E-3	1.11E-02	EPI	EXP
Log Kow (log P; octanol-water)	1.4	1.43	EPI	EXP
Koc (organic carbon; L/Kg)	23.8	21.73	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm ² /s)	0.08	1.05E-01	W9	EST
Diffusivity in Water (Dw; cm ² /s)	8.0E-6	1.1835E-05	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	-58 F	-50	CRC	EXP
Lower Explosivity Level (LEL; unit less)	0.038	0.038	CRC	EXP
Critical Temperature (K)		460.40	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		5.88E+03	EPA2004	EXP
Density (g/mL, g/cm3)		0.918	PC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	2.67E-05	2.81E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	6.40E-05	6.88E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	3.79E-05	4.47E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	9.02E-05	1.09E-04	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	1.8E+1	4.0E-2	PPRTV, 2007/MDEQ, 2015	
RfD details	<p>Chronic rat inhalation study in rats (NTP, 1989). NOAEL=none. LOAEL=5,400 mg/kg/day (estimated TWA dose); Critical effect = depression of mean body weight. UF=300. Source: MDEQ/WRD CCD date: 9/26/1990</p>	<p>Tier 2 Source: PPRTV: Basis: PPRTV subchronic p-RfD = 1.0E-1 mg/kg-day. MDEQ applied an additional UF of 3 to the subchronic p-RfD for subchronic to chronic exposure extrapolation to derive the chronic RfD of 4E-2 mg/kg-day. PPRTV is a Tier 2 source; no tier 1 available. Subchronic p-RfD derivation: Critical Study: Dow Chemical Company. 1995. Ethyl chloride: Palatability and 14-day drinking water study in Fischer 344 rats. Dow Chemical Company. EPA Document #86-990000022S. TSCA 8D submission, OTS0573872. Method(s): Fischer 344 rats (10/sex/group) were given drinking water for 14 days containing 0 or 5,700 mg chloroethane/L water (297 and 361 mg/kg-day for male and female rats, respectively). Critical effect: no adverse effect End point or Point of Departure (POD): “free-standing” NOAEL (i.e., NOAEL reported at the highest dose) = 361 mg/kg-day female rats Uncertainty Factors: UF = 3,000 (10 each for interspecies variability, interspecies extrapolation, database deficiencies and 3 for subacute to subchronic exposure). MDEQ applied an additional UF of 3 to the subchronic p-RfD for sub chronic to chronic exposure extrapolation; therefore a total uncertainty factor of 10,000. Source and date: PPRTV, 7/24/2007</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (4/01/1991), no value at this time. PPRTV: Per PP PRTV (7/24/2007), no chronic p-RfD at this time. A subchronic pRfD = 0.1 mg/kg-day is available. MRL: Per ATSDR (12/2014), no oral chronic MRL at this time.</p> <p>Tier 3 Source:</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		MDEQ: Per DEQ-CCD/WRD (9/26/1990), RfD = 1.8E+1 mg/kg-day. See Part 201 Value RfD details.		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	2.0E-3	2.0E-3	MDEQ, 2008	
CSF details	Uterine carcinomas of endometrial origin in female B6C3F1 mice exposed via inhalation for 2 years (NTP, 1989). Revised species scaling factor of (BWh/BWa) to the 0.25 power used for q* calculation. Source: CCD/SWQD date: 1/11/2000	<p>Tier 3 Source: MDEQ: Basis: WRD and CalEPA used the same NTP (1989) study to develop the oral cancer slope factor. WRD applied the revised ¼ power body weight species scaling factor consistent with the current EPA cancer guidelines. Details for NJ not available. See details below.</p> <p>Carcinogen Weight-of-Evidence (WOE) Class: likely to be carcinogenic to humans IRIS WOE Basis: increased incidences of uterine carcinomas in chloroethane-exposed mice are considered relevant to human health but marginally suitable for quantitative cancer assessment of chloroethane. Although a mutagenic mode of action is plausible, the available data are inadequate to establish a mode of action. The only available inhalation carcinogenicity bioassay (NTP, 1989) used a single chloroethane exposure level (15,000 ppm) at which a high proportion (86%) of female mice developed uterine tumors. Because a mutagenic mode of action cannot be discounted and no other mode of action has been proposed, a linear non-threshold dose-response model would be appropriate. Source and Date: PPRTV, 7/24/2007.</p> <p>Tier 1 Source: IRIS: Per IRIS (1/01/1995), no value at this time.</p> <p>Tier 2 Sources: PPRTV (7/24/2007): Per PPRTV, no value at this time as there are no human or animal oral data on which to base an oral cancer assessment for chloroethane. 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
		<p>MDEQ/WRD (10/24/2008): Per DEQ-CCD, CSF = 2.0E-3 (mg/kg-day)⁻¹ Basis: Uterine carcinomas of endometrial origin in female B6C3F1 mice exposed via inhalation for 2 years (NTP, 1989). A ¼ power body weight species scaling factor was applied. Source and Date: MDEQ-CCD/WRD, 10/24/2008</p> <p>CalEPA/OEHHA (5/2001): CSF = 4.7E-3 (mg/kg-day)⁻¹ Basis: increase in the incidence of uterine carcinomas of endometrial origin in dosed female mice (NTP, 1989). A ½ power body weight species scaling factor was applied. Source: No Significant Risk Level (NSRL) for the Proposition 65 Carcinogen Chloroethane. May, 2001.</p> <p>New Jersey DEP: CFS = 0.0029 (2.9E-3) Basis: NCEA - National Center for Environmental Assessment/EPA Provisional Value Details not available.</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, Minnesota, New York, and Texas, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), ECHA (REACH) and OECD HPV.</p>		
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	1.0E+4	4.0E+3	PPRTV, 2007	
RfC/ITSL details	Based on EPAs RfC, from Scortichini et al 1986. CCD/AQD date:	Tier 2 Source: PPRTV: Basis: PPRTV subchronic pRfC = 4.0E+0 mg/m³. No additional UF to account for subchronic extrapolation is applied since the critical effect is developmental effect from gestational exposure (developmental study). The IRIS (1991) RfC = 1.0E+4		Complete



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
	12/20/1990	<p>mg/kg-day is based on the same study (Scortichini et al., 1986) using the NOAEL approach. PPRTV used benchmark dose modeling to generate the POD.</p> <p>Critical Study: Scortichini, B.H., K.A. Johnson, J.J. Momany-Pfruender, and T.R. Hanley, Jr. 1986. Ethyl chloride: Inhalation teratology study in CF-1 mice. Dow Chemical Co. EPA Document #86-870002248.</p> <p>Method(s): 30 CF-1 mice were exposed to 0, 491 +/-37 ppm (1.3 g/m³), 1,504 +/- 84 ppm (4,000 mg/m³), and 4,946 +/- 159 ppm (13,000 mg/m³) ethyl chloride for 6 hours/day on days 6 through 15 of gestation. The animals were sacrificed on the 18th day of gestation.</p> <p>Critical effect: delayed fetal ossification (foramina of the skull bones)</p> <p>End point or Point of Departure (POD): LEC_{10(HEC)} = 1,078 mg/m³ derived using benchmark dose (BMDS) analysis.</p> <p>Uncertainty Factors: UF = 300 (10 each for interspecies variability and database deficiencies; and 3 for interspecies extrapolation)</p> <p>Source and date: PPRTV, 7/24/2007</p> <p>Tier 1 Source:</p> <p>IRIS: Per IRIS (1991), RfC = 1.0E+4 mg/m³.</p> <p>Critical Study: Scortichini, B.H., K.A. Johnson, J.J. Momany-Pfruender, and T.R. Hanley, Jr. 1986. Ethyl chloride: Inhalation teratology study in CF-1 mice. Dow Chemical Co. EPA Document #86-870002248.</p> <p>Method(s): 30 CF-1 mice were exposed to 0, 491 +/-37 ppm (1.3 g/m³), 1504 +/- 84 ppm (4000 mg/m³), and 4,946 +/- 159 ppm (13,000 mg/m³) ethyl chloride for 6 hours/day on days 6 through 15 of gestation. The animals were sacrificed on the 18th day of gestation.</p> <p>Critical effect: delayed fetal ossification</p> <p>End point or Point of Departure (POD): NOAEL = 4,000 mg/m³ (1504 ppm); NOAEL_{HEC} = 4,000 mg/m³</p> <p>Uncertainty Factors: UF = 300 (10 each for interspecies variability and database deficiencies; and 3 for interspecies extrapolation)</p> <p>Source and date: IRIS, Last revision date: 4/01/1991</p>		

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>Tier 2 Sources: PPRTV: PPRTV (7/24/2007) refers to the IRIS RfC. A subchronic pRfC = 4.0E+0 mg/m³ is derived based on LEC derived using BMDS application. MRL: Per ATSDR (12/1998), no inhalation chronic or intermediate MRL at this time. An acute MRL = 15 ppm (40 mg/m³) is available based on the study of Scortichini et al. (1986).</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, AQD adopted IRIS value for RfC.</p>		
Inhalation Unit Risk Factor (IURF) ((µg/m ³) ⁻¹)	--	NA	MDEQ, 2015	
IURF details	NA	<p>Carcinogen Weight-of-Evidence (WOE) Class: likely to be carcinogenic to humans IRIS WOE Basis: increased incidences of uterine carcinomas in chloroethane-exposed mice are considered relevant to human health but marginally suitable for quantitative cancer assessment of chloroethane. The only available inhalation carcinogenicity bioassay (NTP, 1989) used a single chloroethane exposure level (15,000 ppm) at which a high proportion (86%) of female mice developed uterine tumors. Because a mutagenic mode of action cannot be discounted and no other mode of action has been proposed, a linear non-threshold dose-response model would be appropriate. Source and Date: PPRTV, 7/24/2007.</p> <p>Tier 1 Source: IRIS: Per IRIS (1/01/1995), no value at this time.</p> <p>Tier 2 Sources: PPRTV: Per PPRTV (7/24/2007), no value at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
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	YES-inhalation, the RfC is based on a reproductive-developmental effect. Inhalation Exposure Pathways- Full Term Exposure No for oral exposure. The RfD is not based on a reproductive-developmental effect.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	Critical effect: delayed fetal ossification Critical Study: Scortichini, B.H., K.A. Johnson, J.J. Momany-Pfruender, and T.R. Hanley, Jr. 1986. Ethyl chloride: Inhalation teratology study in CF-1 mice. Dow Chemical Co. EPA Document #86-870002248. Method(s): 30 CF-1 mice were exposed to 0, 491 +/-37 ppm (1.3 g/m ³), 1504 +/- 84 ppm (4000 mg/m ³), and 4946 +/- 159 ppm (13,000 mg/m ³) ethyl chloride for 6 hours/day on days 6 through 15 of gestation. The animals were sacrificed on the 18th day of gestation.		
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, 2015	
SMCL details	NA	NA		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	NA	NA	NA	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
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 _{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)	1,100 (X)
Updated GSI value (µg/L)	1,100 (X)
Rule 57 Drinking Water Value (µg/L)	170

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	500,000	10/2013
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	27,000,000	10/2013
Wildlife Value (WV)	NA	NA
Human Cancer Values for Drinking Water Source (HCV-drink)	170	10/2013
Human Cancer values for non-drinking water source (HCV-Non-drink)	9,400	10/2013
Final Chronic Value (FCV)	1,100	10/2013
Aquatic maximum value (AMV)	10,000	10/2013
Final Acute Value (FAV)	20,000	10/2013

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 ($\mu\text{g}/\text{kg}$)	250	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	5	MDEQ, 2015
Target Detection Limit – Air (ppbv)	3.80E+03	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	1.30E+05	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