



CHEMICAL UPDATE WORKSHEET

Chemical Name:	cis-1,2-Dichloroethylene
CAS #:	156-59-2
Revised By:	RRD Toxicology Unit
Revision Date:	September 21, 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)	192	-80.00	EPI	EXP
Boiling Point (°C)	60.1	60.10	EPI	EXP
Solubility (ug/L)	3.50E+6	6.410E+06	EPI	EXP
Vapor Pressure (mmHg at 25°C)	174.8	2.00E+02	PP	EXP
HLC (atm-m ³ /mol at 25°C)	4.08E-3	4.08E-03	EPI	EXP
Log Kow (log P; octanol-water)	1.86	1.86	EPI	EXP
Koc (organic carbon; L/Kg)	35.6	39.6	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm ² /s)	0.0736	8.84E-02	W9	EST
Diffusivity in Water (Dw; cm ² /s)	1.13E-5	1.1336E-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	6	CRC	EXP
Lower Explosivity Level (LEL; unit less)	0.056	0.03	CRC	EXP
Critical Temperature (K)		5.44E+02	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		7.19E+03	EPA2004	EXP
Density (g/mL, g/cm ³)		1.2837	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	2.62E-05	2.77E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	6.12E-05	6.68E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	3.71E-05	4.41E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	8.54E-05	1.05E-04	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	1.1E-2	2.0E-3	IRIS, 2010	
RfD details	<p>Rat subchronic gavage study (McCauley et al. no year); NOAEL = 32 mg/kg/day; Critical effect = decreased hematocrit and hemoglobin. UF = 3000 (not explained in HEAST). *HEAST oral RfD adjusted to two significant figures. (IRIS, under review). HEAST value under review, current # subject to change. Source: HEAST CCD/RRD - 3/1/1992</p>	<p>Tier 1 Source: IRIS: Basis: IRIS is a Tier 1 source. Critical Studies: 1) McCauley, PT; Robinson, M; Daniel, FB; et al. (1995) The effects of subacute and subchronic oral exposure to cis-1,2-dichloroethylene in Sprague-Dawley rats. Drug Chem Toxicol 18:171–184. 2) McCauley, PT; Robinson, M; Daniel, FB; et al. (1990) The effects of subacute and subchronic oral exposure to cis-1,2-dichloroethylene in rats. Health Effects Research Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH and Toxic Hazards Division, Air Force Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, OH; unpublished report. Method(s): Sprague-Dawley rats (10 rats/sex/group) were administered 0, 32, 97, 291, or 872 mg/kg/d cis-1,2-DCE by corn oil gavage for 90 days. Critical effect: increased relative kidney weights in male rats End point or Point of Departure (POD): BMDL₁₀ = 5.1 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, Last revision date – 9/30/2010. An IRIS Toxicological Review is available.</p> <p>Tier 2 Sources: PPRTV: PPRTV (2/3/2011) refers to the IRIS chronic RfD. A subchronic RfD = 2.0E-2mg/kg/day developed from IRIS (2010) is available. This value omits an UF = 10 for chronic extrapolation. MRL: Per ATSDR April 2015 List, no oral chronic MRL value at this time. An oral intermediate MRL = 0.3 mg/kg-day based on hematological effects; UF = 100; Date – 8/1996 is available. Critical Study: Barnes DW, Sanders VM, White KL Jr, Shopp GM, and Munson AE.</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>1985. Toxicology of trans-1,2-Dichloroethylene in the Mouse. Drug and Chemical Toxicology 8(5):373-392.</p> <p>Methods: 90-day study with 260 male and 260 female mice in the control group and 140 mice of each sex in groups exposed to drinking water with 0.1, 1.0, or 2.0 mg trans-1,2-dichlorethene/mL (males: 0, 17, 175, 387 mg/kg/day; females: 0,23, 224,452 mg/kg/day).</p> <p>Critical effect: Increased serum alkaline phosphatase</p> <p>End point or Point of Departure (POD): NOAEL = 17 mg/kg/day</p> <p>Uncertainty Factors: UF = 100; 10 each for interspecies and intra-species variability</p> <p>Source and date: ATSDR final 08/1996</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD/RRD (3/1/1992), RfD = 1.1E-2 mg/kg-day. See Part 201 Value RfD details. WRD RfD = 0.032 mg/kg/day (9/30/2008). 90-Day rat gavage NOAEL=32 mg/kg/day, LOAEL=98 mg/kg/d for decreased HCT; UF=1000 (McCauley et al., 1995)</p>		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	--	NA	MDEQ, 2015	
CSF details	NA	<p>Carcinogen Weight-of-Evidence (WOE) Class: "inadequate information to assess the carcinogenic potential"</p> <p>IRIS WOE Basis: absence of epidemiological studies in humans and lack of animal studies</p> <p>Source and Date: IRIS, 9/30/2010</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (9/30/2010), no value at this time. PPRTV: Per PPRTV (2/3/2011), 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
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) ($\mu\text{g}/\text{m}^3$)	3.4E+1	8.0E+0	CALEPA, 2015	
RfC/ITSL details	<p>The RfC was based on a 13 week inhalation study (Hoffman et al., 1971) that was translated from the German by the EPA Health Effects Assessment for 1,1-DCE (EPA, 1984). The LOAEL was $4050 \mu\text{g}/\text{m}^3$ 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 $2025 \mu\text{g}/\text{m}^3$ Source: EPA.</p>	<p>Tier 3 Source: CALEPA: Basis: Both MDEQ and CALEPA derived their values by extrapolating the IRIS RfD. However, the CALEPA value assumed an 80 kg body weight (BW), the new EPA OSWER recommended BW while MDEQ used 70 kg. NY, TX and RIVM use surrogates. See details below.</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (9/30/2010), no value at this time. PPRTV: Per PPRTV (2/3/2011), no value at this time. MRL: Per ATSDR List (08/1996), no inhalation value at this time.</p> <p>Tier 3 Sources: MDEQ: ITSL = $7.0\text{E}+0 \mu\text{g}/\text{m}^3$ with 24 hour averaging time was based on a 9/30/2010 IRIS RfD = $2.0 \mu\text{g}/\text{kg}\cdot\text{day}$. RfD was derived as follows: Critical Study: McCauley et al., 1990, 1995 Method(s): male and female SD rats received 0, 32, 97, 291 or 872 mg/kg/day for 90 consecutive days Critical effect: The EPA identified male rat kidney weight changes End point or Point of Departure (POD): BMDL10 = $5.1 \text{mg}/\text{kg}\cdot\text{day}$ Uncertainty Factors: UF = 3,000 (10 each for interspecies variability, interspecies extrapolation and use of a subchronic study, and 3 for database deficiencies) Source and date: MDEQ-CCD/AQD, 9/30/2010</p> <p>California DTSC-EPA: RfC = $8.0\text{E}+00 \mu\text{g}/\text{m}^3$. MDEQ also used route extrapolation</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
	CCD/AQD date: 9/05/1997.	<p>of the same IRIS value; however, California used a body weight of 80 kg (OSWER, 2013) while MDEQ used 70 kg. RIVM (2009) used the surrogate method. Source: HHRA Note Number: 3, DTSC Modified Screening Levels, 5/2015</p> <p>New Jersey DEP: RfC = 35 µg/m³ presented in a 2008 document is based on a 1994 MCL Support Document. A 2011 DEP Division of Air Quality “Toxicity Values for Inhalation Exposure” document does not include cis-1,2-DCE.</p> <p>New York DEC: RfC = 30 µg/m³ is based on an older RIVM value.</p> <p>Texas CEQ: RfC = 6.0E-02 mg/m³ was published by TCEQ in 2011. The RfC is based on a surrogate chemical’s (trans-1,2- Dichloroethylene) RfC of 6E-02 mg/m³.</p> <p>RIVM: Tolerable Concentration in Air (TCA) = 6.0E+1 µg/m³ based on the TCA for a surrogate chemical, trans-1,2-DCE (60 µg/m³). New genotoxicity studies indicate that there is no clear evidence for differences in toxicity between the cis and the trans isomer. Literature search from 2001 through 2008 did not yield new relevant inhalation toxicity studies for cis-DCE. The reliability score for the derivation is medium.</p> <p>Source: RIVM report 601782013/2009: Environmental risk limits for twelve volatile aliphatic hydrocarbons. An update considering human-toxicological data, 2009.</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 Minnesota, WHO (IARC), WHO (IPCS/INCHEM), Canada, ECHA (REACH) and OECD HPV.</p>		
Inhalation Unit Risk Factor (IURF) ((µg/m ³) ⁻¹)	--	NA	MDEQ, 2015	
IURF details	NA	<p>Carcinogen Weight-of-Evidence (WOE) Class: “inadequate information to assess the carcinogenic potential”</p> <p>IRIS WOE Basis: absence of epidemiological studies in humans and lack of animal</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		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: Per PPRTV (2/3/2011), 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.		
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 and ITSL are not based on a reproductive-developmental effect.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	70	70	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	SDWA, 1976 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water?	NO	Not evaluated.	NA	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
(Y/N)				
Aesthetic value (ug/L)	--	NA	NA	
Aesthetic Value details		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)	620
Updated GSI value (µg/L)	620
Rule 57 Drinking Water Value (µg/L)	880

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	880	9/2008
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	36,000	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)	620	7/2000
Aquatic maximum value (AMV)	5,500	7/2000
Final Acute Value (FAV)	11,000	7/2000

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 ($\mu\text{g}/\text{kg}$)	50	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	1	MDEQ, 2015
Target Detection Limit – Air (ppbv)	1.70E+00	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	5.80E+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