United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Proposed Designation of 1,1,2-Trichloroethane (CASRN 79-00-5) as a High-Priority Substance for Risk Evaluation

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Acronyms and Abbreviations

Term	Description
ACGIH	American Conference of Governmental Industrial Hygienists
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation factor
BOD	Biological oxygen demand
BP	Boiling point
CAA	Clean Air Act
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential Business Information
CDR	Chemical Data Reporting
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
CPDat	Chemical and Products Database
ECHA	European Chemicals Agency
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
GC	Gas chromatography
HLC	Henry's law constant
HPLC	High performance liquid chromatography
HSDB	Hazardous Substances Data Bank
IARC	International Agency for Research on Cancer
IUR	Inventory Update Rule
IRIS	Integrated Risk Information System
K_{OC}	Organic carbon-water partition coefficient
K_{OW}	Octanol-water partition coefficient
M	Million
MCL	Maximum Contaminant Level

Term	Description
MCLG	Maximum Contaminant Level Goal
MITI	Ministry of International Trade and Industry
MP	Melting point
NAICS	North American Industry Classification System
NEI	National Emissions Inventory
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NITE	National Institute of Technology and Evaluation (Japan)
NKRA	Not Known or Reasonably Ascertainable
NPDES	National Pollutant Discharge Elimination System
NR	Not reported
OECD	Organization for Economic Cooperation and Development
·OH	Hydroxyl radical
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
POTW	Publicly owned treatment works
REL	Recommended Exposure Limit
RY	Reporting year
SIDS	Screening information data sets
TG	Test guideline
TLV	Threshold limit value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	Time-weighted average
VP	Vapor pressure
WS	Water solubility

1. Introduction

In section 6(b)(1)(B) of the Toxic Substances Control Act (TSCA), as amended, and in the U.S. Environmental Protection Agency's implementing regulations (40 CFR 702.3)[1], a high-priority substance for risk evaluation is defined as a chemical substance that EPA determines, without consideration of costs or other non-risk factors, may present an unreasonable risk of injury to health or the environment because of a potential hazard and a potential route of exposure under the conditions of use, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant by EPA.

Before designating prioritization status, under EPA's regulations at 40 CFR 702.9 and pursuant to TSCA section 6(b)(1)(A), EPA will generally use reasonably available information to screen the candidate chemical substance under its conditions of use against the following criteria and considerations:

- the hazard and exposure potential of the chemical substance;
- persistence and bioaccumulation;
- potentially exposed or susceptible subpopulations;
- storage near significant sources of drinking water;
- conditions of use or significant changes in the conditions of use of the chemical substance;
- the chemical substance's production volume or significant changes in production volume; and
- other risk-based criteria that EPA determines to be relevant to the designation of the chemical substance's priority.

This document presents the review of the candidate chemical substance against the criteria and considerations set forth in 40 CFR 702.9 for a may present risk finding. The information sources used are relevant to the criteria and considerations and consistent with the scientific standards of TSCA section 26(h), including, as appropriate, sources for hazard and exposure data listed in Appendices A and B of the *TSCA Work Plan Chemicals: Methods Document* (February 2012) (40 CFR 702.9(b)). Final designation of the chemical substance as a high-priority chemical substance would immediately initiate the risk evaluation process as described in the EPA's final rule, *Procedures for Chemical Risk Evaluation Under the Amended Toxic Substances Control Act* (40 CFR 702).

1,1,2-Trichloroethane is one of the 40 chemical substances initiated for prioritization as referenced in the March 21, 2019 notice (84 FR 10491)[2]. EPA has determined that 1,1,2-trichloroethane is a suitable candidate for the proposed designation as a high-priority chemical substance. The proposed designation is based on the results of the review against the aforementioned criteria and considerations as well as review of the reasonably available

[1] NOTE: For all 40 CFR 702 citations, please refer to: https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol33/xml/CFR-2018-title40-vol33-part702.xml and https://www.regulations.gov/document?D=EPA-HQ-OPPT-2016-0654-0108

[2] https://www.federalregister.gov/documents/2019/03/21/2019-05404/initiation-of-prioritization-under-the-toxic-substances-control-act-tsca

information on 1,1,2-trichloroethane, including relevant information received from the public and other information as appropriate.

EPA will take comment on this proposed designation for 90 days before finalizing its designation of 1,1,2-trichloroethane. The docket number for providing comments on 1,1,2-trichloroethane is EPA-HQ-OPPT-2018-0421 and is available at www.regulations.gov.

The information, analysis, and basis for the review of the chemical is organized as follows:

- Section 1 *(Introduction):* This section explains the requirements of the amended TSCA and implementing regulations – including the criteria and considerations -- pertinent to the prioritization and designation of high-priority chemical substances.

- *Section 2 (Production volume or significant changes in production volume):* This section presents information and analysis on national aggregate production volume of the chemical substance.

- *Section 3 (Conditions of use or significant changes in conditions of use):* This section presents information and analysis regarding the chemical substance's conditions of use under TSCA.

- *Section 4 (Potentially exposed or susceptible subpopulations):* This section presents information and analysis regarding potentially exposed or susceptible subpopulations, including children, women of reproductive age, and workers, with respect to the chemical substance.

- *Section 5 (Persistence and bioaccumulation):* This section presents information and analysis regarding the physical and chemical properties of the chemical substance and the chemical's fate characteristics.

- *Section 6 (Storage near significant sources of drinking water):* This section presents information and analysis considered regarding the risk from the storage of the chemical substance near significant sources of drinking water.

- *Section 7 (Hazard potential):* This section presents the hazard information relevant to the chemical substance.

- *Section 8 (Exposure potential):* This section presents information and analysis regarding the exposures to the chemical substance.

- *Section 9 (Other risk-based criteria):* This section presents the extent to which EPA identified other risk-based criteria that are relevant to the designation of the chemical substance's priority.

- *Section 10 (Proposed designation):* Based on the results of the review performed and the information and analysis presented, this section describes the basis used by EPA to support the proposed designation.

2. Production volume or significant changes in production volume

Approach

EPA considered current volume or significant changes in volume of the chemical substance using information reported by manufacturers (including importers). EPA assembled reported information for years 1986 through 2015 on the production volume for 1,1,2-trichloroethane reported under the Inventory Update Reporting (IUR) rule and Chemical Data Reporting (CDR) rule.[3]

Results and Discussion

The national aggregate production volume, which is presented as a range to protect individual site production volumes that are confidential business information (CBI), is presented in Table 1.

Table 1. 1986–2015 National Aggregate Production Volume Data (Production Volume in Pounds)

Chemical ID	1986	1990	1994	1998	2002	2006	2011	2012	2013	2014	2015
1,1,2-Trichloroethane (79-00-5)	>100 M - 500 M	>100 M - 500 M	>10 M - 50 M	>100 M - 500 M	>100 M - 500 M	100 M - <500 M	100 M - 250 M	100 M - 250 M	100 M - 250 M	100 M - 250 M	100 M - 250 M

Notes: M = million
Reference: U.S. EPA (2013) and U.S. EPA (2017)

Production volume of 1,1,2-trichloroethane in 2015, as reported to CDR, was 100 million pounds to 250 million pounds. In all reporting years (RY) from 1986 to 2015, with the exception of 1994, national aggregate production volume for 1,1,2-trichloroethane was between 100 million and 500 million pounds. In 1994, 10 million to 50 million pounds of this chemical was manufactured or imported. Production volume of 1,1,2-trichloroethane as reported to EPA has remained stable from 2011-2016 (Table 1).

[3] Over time, the requirements for reporting frequency, production volume thresholds, and chemical substances under the Chemical Data Reporting (CDR) rule have changed. CDR was formerly known as the Inventory Update Rule (IUR). The first IUR collection occurred in 1986 and continued every four years through 2006. As part of two rulemakings in 2003 and 2005, EPA made a variety of changes to the IUR, including to change the reporting frequency to every five years to address burdens associated with new reporting requirements. Additional changes to reporting requirements were made in 2011, including to suspend and replace the 2011 submission period with a 2012 submission period, return to reporting every four years, and require the reporting of all years beginning with 2011 production volumes. The reporting of production volumes for all years was added because of the mounting evidence that many chemical substances, even larger production volume chemical substances, often experience wide fluctuations in production volume from year to year. In addition, also as part of the 2011 IUR Modifications final rule (76 FR 50816, Aug 16, 2011), EPA changed the name of the regulation from IUR to CDR to better reflect the distinction between this data collection (which includes exposure-related data) and the TSCA Inventory itself (which only involves chemical identification information).

3. Conditions of use or significant changes in conditions of use

Approach

EPA assembled information to determine conditions of use or significant changes in conditions of use of the chemical substance. TSCA section 3(4) defines the term "conditions of use" to mean the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of.

A key source of reasonably available information that EPA considered for determining the conditions of use for 1,1,2-trichloroethane was submitted by manufacturers (including importers) under the 2012 and 2016 CDR reporting cycles. CDR requires manufacturers (including importers) to report information on the chemical substances they produce domestically or import into the United States greater than 25,000 pounds per site, except if certain TSCA actions apply (in which case the reporting requirement is greater than 2,500 pounds per site). CDR includes information on the manufacturing, processing, and use of chemical substances. Based on the known manufacturing, processing and uses of this chemical substance, EPA assumes distribution in commerce. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). While EPA may be aware of additional uses, CDR submitters are not required to provide information on chemical uses that are not regulated under TSCA.

For chemical substances under review that are included on the Toxics Release Inventory (TRI) chemical list, information disclosed by reporting facilities in Part II Section 3 ("Activities and Uses of the Toxic Chemical at the Facility") of their TRI Form R reports was used to supplement the CDR information on conditions of use (Tables 4, 5, and 6, respectively). There is not a one-to-one correlation between conditions of use reported under CDR and information reported in Part II Section 3 of the TRI Form R because facilities are not required to disclose in their Form R submissions the specific uses of TRI chemical substances they manufactured on-site or imported. In addition to the information disclosed in Part II Section 3 of the TRI Form R, the information pertaining to waste management activities (i.e., disposal/releases, energy recovery, recycling, and treatment) disclosed in other sections of the Form R was also used to supplement the CDR information on conditions of use as shown in Tables 4, 5, 6, respectively). For the purposes of this proposed prioritization designation, EPA assumed end-of-life pathways that include releases to air, wastewater, and solid and liquid waste based on the conditions of use.

CDR and TRI Tables

Based on the publicly available[4] manufacturing information, industrial processing and use information, and consumer and commercial use information reported under CDR, EPA developed a list of conditions of use for the 2016 and 2012 reporting cycles (Tables 2 and 3, respectively).

[4] Some specific chemical uses may be claimed by CDR submitters as confidential business information (CBI) under section 14 of TSCA. In these cases, EPA has indicated that the information is CBI.

Table 2. 1,1,2-Trichloroethane (79-00-5) Categories and Subcategories of Conditions of Use[5] (2016 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory of Use	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	As a reactant	Intermediate in: •All other chemical product and preparation manufacturing •CBI	U.S. EPA (2019a)
	Recycling	Recycling	U.S. EPA (2019a)
Distribution in Commerce [a,b]	Distribution in commerce		
Disposal [a]	Disposal		

[a] CDR includes information on the manufacturing, processing, and use of chemical substances. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). The table row is highlighted in gray to indicate that no information is provided for this life-cycle stage.
[b] EPA is particularly interested in information from the public on distribution in commerce.

Note: CBI = confidential business information

Table 3. 1,1,2-Trichloroethane (79-00-5) Categories and Subcategories of Conditions of Use[6] (2012 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory of Use	Reference
Manufacturing	Domestic manufacturing/Import	CBI	U.S. EPA (2019a)
	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
Processing	As a reactant	Intermediate in: •All Other Basic Organic Chemical Manufacturing Other (Used to manufacture vinyl chloride) in: •Petrochemical manufacturing	U.S. EPA (2019a)
	Recycling	Recycling	U.S. EPA (2019a)
Distribution in Commerce [a,b]	Distribution in commerce		
Industrial Uses	Use-non-incorporative activities	NKRA in: •All other chemical product and preparation manufacturing	U.S. EPA (2019a)
Disposal [a]	Disposal		

[a] CDR includes information on the manufacturing, processing, and use of chemical substances. CDR may not provide information on other life-cycle phases such as distribution or chemical end-of-life after use in products (i.e., disposal). The table row is highlighted in gray to indicate that no information is provided for this life-cycle stage.
[b] EPA is particularly interested in information from the public on distribution in commerce.

Note: CBI = confidential business information; NKRA = not known or reasonably ascertainable

[5] Certain other uses that are excluded from TSCA are not captured in this table.
[6] Certain other uses that are excluded from TSCA are not captured in this table.

EPA used TRI data to identify additional conditions of use and to supplement CDR information about conditions of use. In addition, TRI information from 2017 is useful for demonstrating that a condition of use reported to CDR in 2015 is still ongoing.

Table 4. Activities and Uses Reported to TRI for 1,1,2-Trichloroethane, Reporting Year 2011

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Plastics Product Manufacturing	3261
	Import	Basic Chemical Manufacturing	3251
	Produce or import for on-site use/processing	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import for sale/distribution	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as a byproduct	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Plastics Product Manufacturing	3261
	Produce or import as an impurity	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
Process	Process as a reactant	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process as an article component	Basic Chemical Manufacturing	3251
	Process as an impurity	Petroleum and Coal Products Manufacturing	3241
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process – repackaging	Waste Treatment and Disposal	5622
Otherwise Use		Basic Chemical Manufacturing	3251

Activity Type	Activity	Industry Group	NAICS Code
	Otherwise Use – ancillary or other use	Plastics Product Manufacturing	3261
		Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622
Waste Management	Disposal/releases	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Plastics Product Manufacturing	3261
		Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622
	Energy recovery	Basic Chemical Manufacturing	3251
		Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622
	Recycling	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Treatment	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Plastics Product Manufacturing	3261
		Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622

Reference: (U.S. EPA, 2019c)

Table 5. Activities and Uses Reported to TRI for 1,1,2-Trichloroethane, Reporting Year 2015

Activity Type	Activity	Industry Group	NAICS Code
Produce	Produce	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Import	Basic Chemical Manufacturing	3251
	Produce or import for on-site use/processing	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import for sale/distribution	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as a byproduct	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as an impurity	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
Process	Process as a reactant	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process as an article component	Waste Treatment and Disposal	5622
	Process as an impurity	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process – repackaging	Waste Treatment and Disposal	5622
Otherwise Use	Otherwise Use – as a manufacturing aid	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
	Otherwise Use – ancillary or other use	Basic Chemical Manufacturing	3251
		Waste Treatment and Disposal	5622

Activity Type	Activity	Industry Group	NAICS Code
Waste Management	Disposal/releases	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
		Waste Treatment and Disposal	5622
	Energy recovery	Basic Chemical Manufacturing	3251
		Waste Treatment and Disposal	5622
	Recycling	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Waste Treatment and Disposal	5622
	Treatment	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
		Waste Treatment and Disposal	5622

Reference: (U.S. EPA, 2019c)

Table 6. Activities and Uses Reported to TRI for 1,1,2-Trichloroethane, Reporting Year 2017

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import for on-site use/processing	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import for sale/distribution	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as a byproduct	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as an impurity	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
Process	Process as a reactant	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process as an impurity	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process – repackaging	Waste Treatment and Disposal	5622
Otherwise Use	Otherwise Use – as a manufacturing aid	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
	Otherwise Use – ancillary or other use	Basic Chemical Manufacturing	3251
		Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622
Waste Management	Disposal/releases	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Cement and Concrete Product Manufacturing	3273

Activity Type	Activity	Industry Group	NAICS Code
		Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
		Waste Treatment and Disposal	5622
	Energy recovery	Cement and Concrete Product Manufacturing	3273
		Waste Treatment and Disposal	5622
	Recycling	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	3327
		Waste Treatment and Disposal	5622
	Treatment	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Waste Treatment and Disposal	5622

Reference: (U.S. EPA, 2019c)

CDR and TRI Summary and Additional Information on Conditions of Use

In the 2016 CDR, 1,1,2-trichloroethane was not reported as used in manufacturing commercial or consumer products. Three sites reported processing of 1,1,2-trichloroethane as an intermediate in all other chemical product and preparation manufacturing and one facility reported this information as CBI.[7] One facility reported that 1,1,2-trichloroethane was recycled, one site reported that 1,1,2-trichloroethane was not recycled (e.g., not recycled, remanufactured, reprocessed, or reused), and two facilities reported this information as CBI.

Between 2012 and 2016, the functional use of 1,1,2-trichloroethane included processing as an intermediate in all other chemical product and preparation manufacturing (Tables 2 and 3, respectively). Use of this chemical in petrochemical and all other chemical product and preparation manufacturing was reported in 2012 but not 2016. In 2012, an industrial use of a non-incorporative activity in all other chemical product and preparation manufacturing was reported. No industrial use was reported for 2016.

The processing uses of 1,1,2-trichloroethane was roughly consistent between 2012 and 2016. Consumer or commercial uses of 1,1,2-trichloroethane we not reported between 2012 and 2016. CDR data show that consumer and commercial uses have not changed significantly between 2012 and 2016. Consumer uses were also identified in additional databases, which are included in the Exposure Potential section (Section 8).

[7] At this time, "CBI" indicates that a data element has been claimed CBI by the information submitter; it does not reflect the result of an EPA substantiation review.

Tables 4, 5, and 6 present the activities and uses reported to TRI by industry group for 2011, 2015, and 2017, respectively. Waste management activity type includes all industry groups that reported to TRI using each waste management activity for 1,1,2-trichloroethane.

TRI data reported in Part II Section 3 of the TRI Form R ("Activities and Uses of the Toxic Chemical at the Facility") were compiled for RY 2011, RY 2015, and RY 2017. RY 2011, RY 2015, and RY 2017 reflect the chemical activities at reporting facilities in calendar years 2011, 2015, and 2017, respectively. Each facility filing a TRI Form R discloses activities that apply to the TRI chemical at the facility. The TRI data presented above are from the TRI dataset updated in April 2019. One public comment indicates that 1,1,2-trichloroethane is found as an impurity in some adhesives in amounts between 0.1% and 10% (EPA-HQ-OPPT-2018-0421-0003).

Should the Agency decide to make a final decision to designate this chemical substance as a high-priority substance, further characterization of relevant TSCA conditions of use will be undertaken as part of the process of developing the scope of the risk evaluation.

4. Potentially exposed or susceptible subpopulations

Approach

In this review, EPA considered reasonably available information to identify potentially exposed or susceptible subpopulations, such as children, women of reproductive age, workers, consumers, or the elderly. EPA analyzed processing and use information included on the CDR Form U. These data provide an indication about whether children may be potentially exposed or other susceptible subpopulations may be exposed. EPA also used human health hazard information to identify potentially exposed or susceptible subpopulations.

Results and Discussion

At this stage, workers and consumers are considered a potentially exposed or susceptible subpopulation with respect to 1,1,2-trichloroethane based on greater exposure.

Children

EPA used data reported to the 2012 and 2016 CDR to identify uses in products and articles intended for children over time for 1,1,2-trichloroethane. The 2012 and 2016 CDR did not report any use in children's products. In the existing assessments reviewed, there was no discussion on the susceptibility of children to 1,1,2-trichloroethane.

Women of reproductive age (e.g., pregnant women per TSCA statute)

EPA identified developmental and reproductive toxicity studies following 1,1,2-trichloroethane exposure; however, no effects were observed in these studies (Section 7, Table 9). Therefore, women of reproductive age are not considered a susceptible subpopulation with respect to 1,1,2-trichloroethane at this time. During the scoping and risk evaluation process, the issue of potentially-exposed or susceptible subpopulations will be reconsidered following a systematic search of the relevant scientific literature.

Workers
Please refer to the Exposure Potential section (Section 8) for a summary of potential occupational exposures, which EPA indicates that workers are potentially exposed or susceptible subpopulations based on greater exposure.

Consumers
Please refer to the Exposure Potential section (Section 8) for summary of potential consumer exposures, which EPA indicates that consumers are potentially exposed or susceptible subpopulations based on greater exposure.

5. Persistence and bioaccumulation

Approach
EPA reviewed reasonably available information, such as physical and chemical properties and environmental fate characteristics, to understand 1,1,2-trichloroethane's persistence and bioaccumulation.

Physical and Chemical Properties and Environmental Fate Tables
Tables 7 and 8 summarize the physical and chemical properties and environmental fate characteristics of 1,1,2-trichloroethane, respectively.

Table 7. Physical and Chemical Properties of 1,1,2-Trichloroethane

Property or Endpoint	Value[a]	Reference
Molecular Formula	$C_2H_3Cl_3$	CRC Handbook (Haynes, 2014)
Molecular Weight	133.41 g/mole	CRC Handbook (Haynes, 2014)
Physical State	Liquid	O'Neil (2013); IARC (1991)
Physical Form	Clear, colorless liquid	HSDB (2008) citing IARC (1991)
Purity	>96%; impurities include ethylene dichloride, tetrachloroethane, trichloroethylene, perchloroethylene	OECD (2000)
Melting Point	−36.6 °C[b]	U.S. EPA (2012); Lide and Milne (1994)
	−35 °C	O'Neil (2013)
	−36.53 °C	ATSDR (1989), citing Riddick et al. (1986)
Boiling Point	113.8 °C[b]	U.S. EPA (2012); Lide and Milne (1994)
	113–114 °C	O'Neil (2013)
Density	1.4416 at 20 °C	O'Neil (2013)
	1.443 at 20 °C	ATSDR (1989) citing Torkelson and Rowe (1981)
	1.43931 at 20 °C	ATSDR (1989) citing Riddick et al. (1986)
	1.43213 g/cm^3 at 25 °C[b]	MacKay (2006) citing Riddick et al. (1986)

Property or Endpoint	Value[a]	Reference
Vapor Pressure	23 mm Hg at 25 °C[b]	U.S. EPA (2012) citing Engineering Sciences Data Unit (1976)
	22.49 mm Hg at 25 °C	MacKay et al. (2006) citing Riddick et al. (1986)
	19 mm Hg at 20 °C, 40 mm Hg at 35 °C	IARC (1991) citing in Verschueren (1983)
Vapor Density	4.63 (relative vapor density to air = 1)	IARC (1991) citing in Verschueren (1983)
Water Solubility	4590 mg/L at 25°C[b]	U.S. EPA (2012) citing Horvath et al. (1999)
	3500 mg/L at 25 °C	OECD (2000)
	4500 mg/L at 20 °C	IARC (1991)
Log K_{OW}	1.89[b]	U.S. EPA (2012) citing Hansch et al. (1995)
	2.05 at 25 °C	OECD (2000)
Henry's Law Constant	8.24×10^{-4} atm-m^3/mol at 25 °C[b]	U.S. EPA (2012) citing Leighton and Calo (1981)
	9.1×10^{-4} atm/m^3-mol at 25 °C; 1.12×10^{-3} atm/m^3-mol at 30 °C	ATSDR (1989) citing Ashworth et al. (1988)
Flash Point	None detected up to 75 °C (Guideline ASTM D93)	ECHA (2019) citing Anonymous (2010)
Auto Flammability	460 °C	ATSDR (1989) citing Parrish (1983)
Viscosity	1.69 cP at 25 °C	HSDB (2008)
Refractive Index	1.4711 at 20 °C	O'Neil (2013)
Dielectric Constant	3.42 at 16 °C	NBOS (1951)
Surface Tension	34.02 mN/m at 25 °C	HSDB (2008) citing CRC (2005)

Notes: [a] Measured unless otherwise noted; [b] Selected value

Table 8. Environmental Fate Characteristics of 1,1,2-Trichloroethane

Property or Endpoint	Value[a]	References
Direct Photodegradation	Not expected to be susceptible to direct photolysis by sunlight because the chemical structure of 1,1,2-trichloroethane does not contain chromophores that absorb at wavelengths >290 nm	HSDB (2008)
Indirect Photodegradation	$t_{1/2}$ = 54.6 days (from ·OH rate constant of 1.96×10^{-13} cm^3/molecule-sec and 12-hour day with 1.5×10^6 ·OH/cm^3)	U.S. EPA (2012)
	$t_{1/2}$ = 87.2 days at 295 K, 5×10^5 ·OH-radical molecules/cm^3	ECHA (2019)
	$t_{1/2}$ = 50.2 days at 339 K, 5×10^5 ·OH-radical molecules/cm^3	ECHA (2019)
Hydrolysis	Stable at pH 7; $t_{1/2}$ = 85 days pH 9 and 25 °C	OECD (2000)

Property or Endpoint	Value[a]	References
Biodegradation (Aerobic)	Water: 5% after 28 days measured by GC (Japanese MITI test)	NITE (2010)
	Water: Not readily biodegradable (OECD TG 301C)	OECD (2000)
	Water: 0% after a 24-day modified shake-flask test; 0% after a 25-day river die-away test	HSDB (2008) citing Tabak et al. (1981)
	Soil: $t_{1/2}$ = 6 months to 1 year	HSDB (2008), citing Rathbun (1998)
Biodegradation (Anaerobic)	Water: 6 days in an unpolluted aquifer (1% organic carbon content); 16 years in an unpolluted aquifer (0.001% organic carbon content)	HSBD (2008), citing Verschueren (2001)
Wastewater Treatment	27.43% total removal (0.08% by biodegradation, 1.64% by sludge adsorption, and 25.72% by volatilization to air; estimated)[b]	U.S. EPA (2012)
Bioconcentration Factor	<10 to 17	ATSDR (1989)
	OECD TG 305C (carp): 0.7–2.6 at 0.3 mg/L; 2.9-4.0 at 0.03 mg/L	OECD (2000)
	Carp (*Cyprinus carpio)*: 0.7–2.6 at 0.3 ppm; 2.7–6.7 at 0.03 ppm (MITI)	SYKE (2018)
Bioaccumulation Factor	6.9 (estimated)[b]	U.S. EPA (2012)
Soil Organic Carbon:Water Partition Coefficient (Log K_{OC})	1.9–2.05 (K_{OC} = 83–111) in silty clay soil; 2.2–2.32 (K_{OC} = 174–209) in sandy loam soil	HSDB (2008) citing Gan et al. (1989)

Notes: [a] Measured unless otherwise noted; [b] EPI Suite™ physical property inputs: Log K_{OW} = 1.89, BP = 113.80 ºC, MP = −36.60 ºC, VP = 23 mm Hg, WS = 4,590 mg/L, HLC = 0.000824·OH = hydroxyl radical;
OECD = Organization for Economic Cooperation and Development; TG = test guideline; GC = gas chromatography; MITI = Ministry of International Trade and Industry; BOD = biochemical oxygen demand; HPLC = high performance liquid chromatography

Results and Discussion

1,1,2-Trichloroethane is a liquid that is highly soluble in water (4,590 mg/L) and highly volatile (23 mm Hg). Measured Henry's Law constant (8.24×10^{-4} atm-m^3/mol) and vapor pressure data indicate that this chemical will not be persistent in surface water or soil as it will likely volatilize upon release. In the air, 1,1,2-trichloroethane is expected to exist in the vapor phase where it may react with photochemically produced hydroxyl radicals at rates corresponding to a half-life of 54.6 days. 1,1,2-Trichloroethane does not hydrolyze at pH 7, but has a hydrolysis half-life of 85 days at pH 9.

In aerobic aquatic environments, 1,1,2-trichloroethane is not readily biodegradable. It showed no biodegradation after 24 days in a shake-flask test and no biodegradation after 25 days in a river die-away test. It achieved only 5 percent degradation over a 28-day incubation period in a Japanese Ministry of International Trade and Industry (MITI) test; its biodegradation half-life in soil is 6 months to a year. Based on these results, 1,1,2-trichloroethane may persist in subsurface environments, groundwater, or enclosed pipes when volatilization is not an option. 1,1,2-Trichloroethane displayed low bioaccumulation potential with measured bioconcentration factor

values of 0.7 to 6.7 in carp. Low bioaccumulation potential for this chemical is supported by an estimated bioaccumulation factor (BAF) of 6.9 and a measured log K_{ow} of 1.89.

6. Storage near significant sources of drinking water

Approach

To support the proposed designation, EPA screened each chemical substance under its conditions of use with respect to the seven criteria in TSCA section 6(b)(1)(A) and 40 CFR 702.9. The statute specifically requires the Agency to consider the chemical substance's storage near significant sources of drinking water, which EPA interprets as direction to focus on the chemical substance's potential human health hazard and exposure.

EPA reviewed reasonably available information, specifically looking to identify certain types of existing regulations or protections for the proposed chemical substances. EPA considered the chemical substance's potential human health hazards, including to potentially exposed or susceptible subpopulations, by identifying existing National Primary Drinking Water Regulations under the Safe Drinking Water Act (SDWA; 40 CFR Part 141) and regulations under the Clean Water Act (CWA; 40 CFR 401.15). In addition, EPA considered the consolidated list of chemical substances subject to reporting requirements under the Emergency Planning and Community Right-to-Know Act (EPCRA; Section 302 Extremely Hazardous Substances and Section 313 Toxic Chemicals), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; Hazardous Substances), and the Clean Air Act (CAA) Section 112(r) (Regulated Chemicals for Accidental Release Prevention). Regulation by one of these authorities is an indication that the substance is a potential health or environmental hazard which, if released near a significant source of drinking water, could present an unreasonable risk of injury to human health or the environment.

Results and Discussion

EPA has established a Maximum Contaminant Level Goal (MCLG) and Maximum Contaminant Level (MCL) for 1,1,2-trichloroethane due to potential health effects from long-term exposure above the MCL (52 FR 25690 January 30, 1991). 1,1,2-Trichloroethane is designated as a toxic pollutant under the CWA and is subject to reporting requirements under the EPCRA. It is also considered a CERCLA hazardous substance and releases in excess of 100 pounds must be reported (40 CFR 302.4).

1,1,2-Trichloroethane is also subject to the Resource Conservation and Recovery Act [RCRA; hazardous waste numbers U227 (40 CFR 261.33); F002, F024, F025 (40 CFR 261.31); K019, K020, K095, K096 (40 CFR 261.32)]. RCRA directs EPA to develop and promulgate criteria for identifying the characteristics of hazardous waste, and for listing hazardous waste, taking into account toxicity, persistence, and degradability in nature, potential for accumulation in tissue and other related factors such as flammability, corrosiveness, and other hazardous characteristics.

7. Hazard potential

Approach

EPA considered reasonably available information from peer-reviewed assessments and databases to potential human health and environmental hazards for 1,1,2-trichloroethane (Tables 9 and 10, respectively).

EPA used the infrastructure of ECOTOXicology knowledgebase (ECOTOX) to identify single chemical toxicity data for aquatic and terrestrial life (U.S. EPA, 2018a). It uses a comprehensive chemical-specific literature search of the open literature that is conducted according to the Standard Operating Procedures (SOPs)[8]. The environmental hazard information was populated in ECOTOX and is available to the public. In comparison to the approach used to survey human health hazard data, EPA also used a read-across approach to identify additional environmental hazard data for isomers of 1,1,2-trichloroethane, if available, to fill in potential data gaps when there were no reported observed effects for specific taxa exposed to the 1,1,2-trichloroethane (Table 10).

Potential Human Health and Environmental Hazard Tables

EPA identified human health and environmental hazards based on a review of the reasonably available information on 1,1,2-trichloroethane (Table 9 and Table 10, respectively).

[8] The ECOTOX Standard Operating Procedures (SOPs) can be found at: https://cfpub.epa.gov/ecotox/

Table 9. Potential Human Health Hazards Identified for 1,1,2-Trichloroethane

Human Health Hazards	Tested for a Specific Effect?	Specific Effect Observed	Data Source
Acute Toxicity	X	X	OECD (2000); ATSDR (1989)
Repeated Dose Toxicity	X	X	U.S. EPA (2011); ATSDR (2010); CalEPA (2006); OECD (2000); IARC (1999); ATSDR (1989); U.S. EPA (1987); NCI (1978)
Genetic Toxicity	X	X	OECD (2003); OECD (2000); IARC (1999); ATSDR (1989); U.S. EPA (1987)
Reproductive Toxicity	X		ATSDR (1989)
Developmental Toxicity	X		U.S. EPA (2011); OECD (2000); ATSDR (1989)
Toxicokinetic	X	X	OECD (2000); IARC (1999); ATSDR (1989)
Irritation/Corrosion	X	X	CalEPA (2006); OECD (2000); ATSDR (1989)
Dermal Sensitization			
Respiratory Sensitization			
Carcinogenicity	X	X	U.S. EPA (2011); ATSDR (2010); CalEPA (2006); OECD (2000); IARC (1999); ATSDR (1989); U.S. EPA (1987); NCI (1978)
Immunotoxicology	X	X	U.S. EPA (2011); ATSDR (1989)
Neurotoxicity	X	X	CalEPA (2006); OECD (2000); ATSDR (1989)
Epidemiological Studies or Biomonitoring Studies	X	X	ATSDR (2010)

Note: The "X" in the "Effect Observed" column indicates when a hazard effect was reported by one or more of the referenced studies. Blank rows indicate when information was not identified during EPA's review of reasonably available information to support the proposed designation.

Table 10. Potential Environmental Hazards Identified for 1,1,2-Trichloroethane

Media	Study Duration	Taxa Groups	High Priority Chemical Candidate 1,1,2-Trichloroethane (CASRN# 79-00-5)		Isomers of 1,1,2-Trichloroethane (CASRN 79-00-5) 1,1,1-Trichloroethane (CASRN# 71-55-6) Trichloroethane (CASRN# 25323-89-1)		Data Sources
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
Aquatic	Acute exposure	Vegetation	8	X	3	X	Adema and Vink (1981); Brack and Frank (1998); Brack and Rottler (1994); Tsai and Chen (2007)
		Invertebrate	15	X	3	X	Adema (1978); Adema and Vink (1981); Call et al. (1980); Freitag et al. (1994); LeBlanc (1980); Roghair et al. (1994); Sanchez-Fortun et al. (1997)
		Fish	7	X	5	X	Adema and Vink (1981); Alexander et al. (1978); Buccafusco et al. (1981); Dow Chemical Co. (1976); Geiger et al. (1985); Geiger et al. (1986); Heitmuller et al. (1981); Smith et al. (1991); Walbridge et al. (1983)
		Non-Fish Vertebrates (i.e., amphibians, reptiles, mammals)	-		1	X	Cruz et al. (2000)
	Chronic exposure	Vegetation	-		-		
		Invertebrate	11	X	1	X	Adema (1978); Adema and Vink (1981); Call et al. (1980); Thompson and Carmichael (1989)
		Fish	5	X	2	X	Adema and Vink (1981); Ahmad et al. (1984); Barrows et al. (1978); Smith et al. (1991); Thompson and Carmichael (1989)

Media	Study Duration	Taxa Groups	High Priority Chemical Candidate 1,1,2-Trichloroethane (CASRN# 79-00-5)		Isomers of 1,1,2-Trichloroethane (CASRN 79-00-5) 1,1,1-Trichloroethane (CASRN# 71-55-6) Trichloroethane (CASRN# 25323-89-1)		Data Sources
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
		Non-Fish Vertebrates (i.e., amphibians, reptiles, mammals)	-		-		
Terrestrial	Acute exposure	Vegetation	1	X	1	X	Crebelli et al. (1988)
		Invertebrate	1	X	1	X	Neuhauser et al. (1985)
		Vertebrates	3	X	1	X	Crebelli et al. (1995); Crebelli et al. (1999); Miyagawa et al. (1995)
	Chronic exposure	Vegetation	1	X	2	X	Dietz and Schnoor (2001); Hulzebos et al. (1993)
		Invertebrate	-		1	X	Rajendran (1990)
		Vertebrates	1	X	2	X	Bernard et al. (1989); Elovaara et al. (1979)

The dash indicates that no studies relevant for environmental hazard were identified during the initial review and thus the "Observed Effects" column is left blank. The X in the Observed Effects column indicates when a hazard effect was reported by one or more of the referenced studies. The N/A in the Observed Effects column indicates when a hazard effect was not reported by one of the referenced studies' abstract (full reference review has not been conducted).

8. Exposure potential

Approach

EPA considered reasonably available information to identify potential environmental, worker/occupational, consumer, and general population exposures to 1,1,2-trichloroethane.

Release potential for environmental and human health exposure

In addition to other required information, a submission of a TRI Form R report must include the quantities of a TRI chemical the facility released on-site to air, water, or land, and the quantities it transferred off-site to another facility for further waste management. On-site release quantities are reported in Part II Section 5 of the TRI Form R, and off-site transfers are reported in Part II Section 6. Waste management activities include: transfers of a TRI chemical in wastewater to a publicly owned treatment works (POTW) facility or to a non-POTW wastewater treatment facility for the purpose of treatment for destruction or removal; combustion for energy recovery; treatment (treatment includes treatment via incineration for destruction and waste stabilization); recycling; and release, including disposal. During treatment, combustion for energy recovery, or recycling activities, it is possible that some of the quantities of the TRI chemical will be released to the environment.

Worker/Occupational and consumer exposure

EPA's approach for assessing exposure potential was to review the physical and chemical properties, conditions of use reported in CDR, and information from the National Institutes of Health Consumer Product Database and the Chemical and Products Database (CPDat) for 1,1,2-trichloroethane to inform occupational and consumer exposure potential. The results of this review are detailed in the following tables.

General population exposure

EPA identified environmental concentration, human and ecological biomonitoring data to inform 1,1,2-trichlorpropane's exposure potential to the general population (Table 13).

Results and Discussion

Release potential for environmental and human health exposure

Aggregated quantities of 1,1,2-trichloroethane released on-site to air, water, and land, and aggregated quantities of 1,1,2-trichloroethane transferred off-site to POTW and other wastewater treatment facilities (non-POTW) are presented in Table 11 for RY 2011, 2015, and 2017. The table does not include any of the reported quantities pertaining to other waste management activities (e.g., recycling, combustion for destruction) that occurred on-site or off-site during RY 2011, 2015, and 2017. The "Number of Facilities" is the count of unique facilities that filed a TRI Form R report for 1,1,2-trichloroethane for RY 2011, 2015, and 2017. The TRI data presented were obtained from the TRI dataset following its update in April 2019.

Table 11. The TRI Data on 1,1,2-Trichloroethane from Reporting Years 2011, 2015, and 2017 and Used in this Document to Assess Exposure Potential

Year	Number of Facilities That Reported	Total Quantities Released On-Site to Air (pounds)	Total Quantities Released On-Site to Water (pounds)	Total Quantities Released (Disposed of) On-Site to Land (pounds)	Total Quantities Transferred to POTW (pounds)	Total Quantities Transferred to Other (Non-POTW) Wastewater Treatment Facilities (pounds)
2011	25	19,957	442	2	0	0
2015	25	39,299	27	17,274	4,186	0
2017	27	43,006	32	0	0	46

POTW = publicly owned treatment works
Reference: U.S. EPA, 2019c

For RY 2017, 27 facilities submitted TRI reports for 1,1,2-trichloroethane. The total quantities of 1,1,2-trichloroethane these facilities released on-site to air (as fugitive and stack emissions), surface water and land are: 43,006 pounds; 32 pounds; and 0 pounds, respectively. These facilities reported zero pounds of the chemical transferred to POTW and 46 pounds transferred off-site to other non-POTW wastewater treatment facilities for the purpose of wastewater treatment. These transfer categories represent two types of off-site transfers for wastewater treatment that may lead to releases from the receiving facilities. They do not include quantities sent off-site for other types of waste management activities that include, or may lead to, releases of the chemical.

Quantities transferred off-site represent the amount of a toxic chemical a facility sent off-site prior to any waste management (e.g., treatment) at a receiving facility. Some of the quantities of 1,1,2-trichloroethane received by the non-POTW wastewater treatment facilities may have been released to surface waters or to air during treatment processes at the facilities.

1,1,2-Trichloroethane has a vapor pressure of around 23 mm Hg at 25 ºC. This chemical's vapor pressure indicates potential for air releases from volatilization during manufacturing, processing, and use.

When chemical substances are used as reactants and as intermediates, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the chemical reacts without excess loss during its use as an intermediate. It is unknown the actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use.

Worker/Occupational exposure
Worker exposures to this chemical may be affected by many factors, including but not limited to volume produced, processed, distributed, used and disposed of; physical form and concentration; processes of manufacture, processing, and use; chemical properties such as vapor pressure, solubility, and water partition coefficient; local temperature and humidity; and exposure controls such as engineering controls, administrative controls, and the existence of a personal protective equipment (PPE) program.

1,1,2- Trichloroethane has an Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) [9]. The PEL is 10 parts per million (ppm) or 45 milligrams (mg)/cubic meter (m^3) over an 8-hour work day, time weighted average (TWA). This chemical also has a National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)[10] of 10 ppm (45 mg/m^3) TWA. The American Conference of Governmental Industrial Hygienists (ACGIH) set the Threshold Limit Value (TLV) at 10 ppm TWA.

1,1,2- Trichloroethane has a vapor pressure of approximately 23 mm Hg at 25 °C/77 °F. 1,1,2-Trichloroethane's vapor pressure indicates the potential for inhalation exposure to vapors generated by the liquid at ambient room temperature conditions. The extent of inhalation exposure could vary from facility to facility depending on many factors including but not limited to engineering control, type of facility and design.

Consumer exposure
CDR reporting and information from the National Institutes of Health Consumer Product Database and the Chemical and Products Database (CPDat) indicate that 1,1,2-trichloroethane appears in automotive products. Little additional information was discussed regarding consumer exposure in the assessments reviewed and the Consumer Product Database and the CPDat (U.S. EPA 2019b) (Table 12).

Table 12. Exposure Information for Consumers

Chemical Identity	Consumer Product Database
	Consumer Uses (List)
1,1,2-Trichloroethane (79-00-5)	Automotive

Reference: CPDat

General population exposure
EPA identified environmental concentration, human biomonitoring and ecological biomonitoring data to inform 1,1,2-trichloroethane's exposure potential to the general population.

Table 13. Exposure Information for the Environment and General Population

Database Name	Env. Concen. Data Present?	Human Biomon. Data Present?	Ecological Biomon. Data Present?	Reference
California Air Resources Board	no	no	no	CARB (2005)

[9] OSHA, 2009. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs). https://www.osha.gov/dsg/annotated-pels/tablez-1.html
[10] NIOSH, 2005. NIOSH Pocket Guide to Chemical Hazards. https://www.cdc.gov/niosh/npg/npgdcas.html

Database Name	Env. Concen. Data Present?	Human Biomon. Data Present?	Ecological Biomon. Data Present?	Reference
Comparative Toxicogenomics Database	no	no	no	MDI (2002)
EPA Ambient Monitoring Technology Information Center – Air Toxics Data	yes	no	no	U.S. EPA (1990)
EPA Discharge Monitoring Report Data	yes	no	no	U.S. EPA (2007)
EPA Unregulated Contaminant Monitoring Rule	yes	no	no	U.S. EPA (1996)
FDA Total Diet Study	no	no	no	FDA (1991)
Great Lakes Environmental Database	yes	no	no	U.S. EPA (2018b)
Information Platform for Chemical Monitoring Data	yes	no	no	EC (2018)
International Council for the Exploration of the Sea	no	no	no	ICES (2018)
OECD Monitoring Database	no	yes	no	OECD (2018)
Targeted National Sewage Sludge Survey	no	no	no	U.S. EPA (2006)
The National Health and Nutrition Examination Survey	no	no	no	CDC (2013)
USGS Monitoring Data –National Water Quality Monitoring Council	no	no	no	USGS (1991a)
USGS Monitoring Data –National Water Quality Monitoring Council, Air	no	no	no	USGS (1991b)
USGS Monitoring Data –National Water Quality Monitoring Council, Ground Water	yes	no	no	USGS (1991c)
USGS Monitoring Data –National Water Quality Monitoring Council, Sediment	yes	no	no	USGS (1991d)
USGS Monitoring Data –National Water Quality Monitoring Council, Soil	yes	no	no	USGS (1991e)
USGS Monitoring Data –National Water Quality Monitoring Council, Surface Water	yes	no	no	USGS (1991f)
USGS Monitoring Data –National Water Quality Monitoring Council, Tissue	no	no	yes	USGS (1991g)

[a] Concen.= concentration
[b] Biomon.= biomonitoring

Releases of 1,1,2-trichloroethane from certain conditions of use, such as manufacturing, disposal, or waste treatment activities, may result in general population exposures via drinking water ingestion, dermal contact, and inhalation from air releases. The general population is primarily exposed via inhalation indoors from use of paint, adhesive, or cleaning agents; a biomonitoring survey found that more than 95 percent of blood samples collected from the general population had 1,1,2-trichloroethane at levels below detection (ATSDR 2010). Small amounts of 1,1,2-trichloroethane are produced during chlorination of drinking water (CalEPA 2006). Susceptible subpopulations will respond differently to 1,1,2-trichloroethane exposure compared with the general population.

EPA anticipates releases of 1,1,2-trichloroethane into the environment because of the conditions of use for 1,1,2-trichloroethane, particularly activities associated with the chemical's manufacturing. A review of monitoring data collected under EPA rules and statutes (e.g., CAA, CWA, SDWA, National Pollutant Discharge Elimination System) indicates that 1,1,2-trichloroethane is detected in air, water, and soil (Table 13).

Estimated background levels of 0.00039 μg/m^3 were modeled from emissions data available in 2011 in which reported National Emissions Inventory (NEI) was 48 tons per year (U.S. EPA 2015). 1,1,2-Trichloroethane can form in landfills as its parent compound, 1,1,2,2-tetrachloroethane, is broken down; when released into the environment, the majority of 1,1,2-trichloroethane ends up in the air although some may enter groundwater (ATSDR 1989).

9. Other risk-based criteria that EPA determines to be relevant to the designation of the chemical substance's priority

EPA did not identify other risk-based criteria relevant to the designation of the chemical substance's priority.

10. Proposed designation and Rationale

Proposed Designation: High-priority substance

Rationale: EPA identified and analyzed reasonably available information for exposure and hazard and is proposing to find that 1,1,2-trichloroethane may present an unreasonable risk of injury to health and/or the environment, including potentially exposed or susceptible subpopulations, (e.g., workers and consumers). This is based on the potential hazard and potential exposure of 1,1,2-trichloroethane under the conditions of use described in this document to support the prioritization designation. Specifically, EPA expects that the manufacturing, processing, distribution, use and disposal of 1,1,2-trichloroethane may result in presence of the chemical in surface water and groundwater, ingestion of the chemical in drinking water, inhalation of the chemical from air releases, and exposure to workers and exposure to the general population. In addition, EPA identified potential environmental (e.g., aquatic toxicity, terrestrial toxicity), and human health hazards (e.g., acute toxicity, repeated dose toxicity, genetic toxicity, toxicokinetic, irritation/corrosion, carcinogenicity, immunotoxicity, neurotoxicity, observations in epidemiological studies and biomonitoring studies).

11. References

Note: All hyperlinked in-text citations are also listed below

Adema, DMM. (1978). Daphnia magna as a test animal in acute and chronic toxicity tests. 59: 125-134.

Adema, DMM; Vink, GJ. (1981). A comparative study of the toxicity of 1,1,2-trichloroethane, dieldrin, pentachlorophenol and 3,4 dichloroaniline for marine and fresh water organisms. 10: 533-554.

Ahmad, N; Benoit, D; Brooke, L; Call, D; Carlson, A; Defoe, D; Huot, J; Moriarity, A; Richter, J; Shubat, P; Veith, G; Wallbridge, C. (1984). Aquatic toxicity tests to characterize the hazard of volatile organic chemicals in water: A toxicity data summary--Parts I and II (pp. 103 p.). Ahmad, N; Benoit, D; Brooke, L; Call, D; Carlson, A; Defoe, D; Huot, J; Moriarity, A; Richter, J; Shubat, P; Veith, G; Wallbridge, C.

Alexander, HC; McCarty, WM; Bartlett, EA. (1978). Toxicity of perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, and methylene chloride to fathead minnows. 20: 344-352. http://dx.doi.org/10.1007/BF01683531

Ashworth RA; Howe GB; Mullins ME; Rogers TN. (1988). Air-water partitioning coefficients of organics in dilute solutions. J Hazard Mater 18: 25-36.

ATSDR (Agency for Toxic Substances and Disease Registry). (1989). Toxicological profile for 1,1,2-trichloroethane. Atlanta, GA: U.S. Department of Health and Human Services, U.S. Public Health Service https://www.atsdr.cdc.gov/ToxProfiles/tp148.pdf

ATSDR (Agency for Toxic Substances and Disease Registry). (2010). Addendum to the toxicological profile for 1,1,2-trichloroethane. Atlanta, GA: U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine. https://www.atsdr.cdc.gov/toxprofiles/1_1_2_trichloroethane_addendum.pdf?id=1166&tid=155

Barrows, M.E., S.R. Petrocelli, K.J. Macek, and J.J. Carroll. (1980). Bioconcentration and Elimination of Selected Water Pollutants by the Bluegill Sunfish (Lepomis macrochirus) In: Dyn. Exposure Hazard Assess. Toxic Chem., (Pap. Symp. 1978), Ann Arbor Sci., Ann Arbor-, MI:379-392; Am. Chem. Soc., Div. Environ. Chem. 18(2):345-346 (1978) (ABS); Abstr. Pap. Am. Chem. Soc. 176:125 (1978)

Benoit, DA; Puglisi, FA; Olson, DL. (1982). A fathead minnow Pimephales promelas early life stage toxicity test method evaluation and exposure to four organic chemicals. Environmental Pollution Series A, Ecological and Biological 28: 189-197. http://dx.doi.org/10.1016/0143-1471(82)90075-7

Bernard, AM; de Russis, R; Normand, JC; Lauwerys, RR. (1989). Evaluation of the subacute nephrotoxicity of cyclohexane and other industrial solvents in the female Sprague-Dawley rat. Toxicology letters 45: 271-280.

Brack, W; Frank, H. (1998). Chlorophyll a fluorescence: A tool for the investigation of toxic effects in the photosynthetic apparatus. Ecotoxicology and Environmental Safety 40: 34-41.

Brack, W; Rottler, H. (1994). Toxicity testing of highly volatile chemicals with green algae: A new assay. Environmental Science and Pollution Research 1: 223-228.

Buccafusco, RJ; Ells, SJ; LeBlanc, GA. (1981). Acute toxicity of priority pollutants to bluegill (Lepomis macrochirus). Bulletin of Environmental Contamination and Toxicology 26: 446-452. http://dx.doi.org/10.1007/BF01622118

CalEPA (California Environmental Protection Agency). (2006). Public health goals for chemicals in drinking water: 1,1,2-trichloroethane. California: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Pesticide and Environmental Toxicology Branch. https://oehha.ca.gov/media/downloads/water/chemicals/phg/phg112tca030306.pdf

Call, DJ; Brooke, LT; Ahmad, N. (1980). Toxicity, bioconcentration, and metabolism of selected chemicals in aquatic organisms: Fourth quarterly progress report to EPA (1 January - 31 March 1980) (pp. 80). (U.S. EPA Cooperative Agreement No. CR 806864020). Call, DJ; Brooke, LT; Ahmad, N.

CARB (California Air Resources Board). (2005). California Air Resources Board (CARB): Indoor air pollution in California [Database]. Retrieved from https://www.arb.ca.gov/research/apr/reports/l3041.pdf

CDC (Centers for Diseases Control and Prevention). (2013). National Health and Nutrition Examination Survey Data (NHANES) [Database]. Atlanta, GA: CDC, National Center for Health Statistics. Retrieved from https://www.cdc.gov/nchs/nhanes/index.htm

CRC (Coordinating Research Council,). (2005). 1,1,2-Trichloroethane. In CRC Handbook of Chemistry and Physics (86th ed.). Boca Raton: CRC Press, Taylor & Francis.

Crebelli, R; Andreoli, C; Carere, A; Conti, L; Crochi, B; Cotta-Ramusino, M; Benigni, R. (1995). Toxicology of halogenated aliphatic hydrocarbons: Structural and molecular

determinants for the disturbance of chromosome segregation and the induction of lipid peroxidation. Chemico-biological interactions 98: 113-129. http://dx.doi.org/10.1016/0009-2797(95)03639-3

Crebelli, R; Benigni, R; Franekic, J; Conti, G; Conti, L; Carere, A. (1988). Induction of chromosome malsegregation by halogenated organic solvents in Aspergillus nidulans: Unspecific or specific mechanism? Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis 201: 401-411. https://doi.org/10.1016/0027-5107(88)90027-9

Crebelli, R; Carere, A; Leopardi, P; Conti, L; Fassio, F; Raiteri, F; Barone, D; Ciliutti, P; Cinelli, S; Vericat, JA. (1999). Evaluation of 10 aliphatic halogenated hydrocarbons in the mouse bone marrow micronucleus test. Mutagenesis 14: 207-215. http://dx.doi.org/10.1093/mutage/14.2.207

Cruz, SL; Balster, RL; Woodward, JJ. (2000). Effects of volatile solvents on recombinant N-methyl-D-aspartate receptors expressed in Xenopus oocytes. British journal of pharmacology 131: 1303-1308. http://dx.doi.org/10.1038/sj.bjp.0703666

Dietz, AC; Schnoor, JL. (2001). Phytotoxicity of chlorinated aliphatics to hybrid poplar (Populus deltoides x nigra DN34). Environmental Toxicology and Chemistry: An International Journal 20: 389-393. http://dx.doi.org/10.1897/1551-5028(2001)020<0389:POCATH>2.0.CO;2

Dow Chemical. (1976). Acute fish toxic of five chlorinated solvents. (OTS: OTS0517162; 8EHQ Num: NA; DCN: 86-870002073; TSCATS RefID: 309898; CIS: NA). Dow Chem Co.

ECHA (European Chemicals Agency). (2019). Registration dossier: 79-00-5. Helsinki, Finland. https://echa.europa.eu/registration-dossier/-/registered-dossier/1878

EC (European Commission). (2018). Information Platform for Chemical Monitoring Data (IPCHEM) [Database]. Retrieved from https://ipchem.jrc.ec.europa.eu/RDSIdiscovery/ipchem/index.html

Elovaara, E; Hemminki, K; Vainio, H. (1979). Effects of methylene chloride, trichloroethane, trichloroethylene, tetrachloroethylene and toluene on the development of chick embryos. Toxicology 12: 111-119. http://dx.doi.org/10.1016/0300-483X(79)90037-4

FDA (U.S. Food and Drug Administration). (1991). FDA Total Diet Study [Database]. Retrieved from http://www.fda.gov/Food/FoodScienceResearch/TotalDietStudy/ucm184293.htm

Freitag, D; Ballhorn, L; Behechti, A; Fischer, K; Thumm, W. (1994). Structural configuration and toxicity of chlorinated alkanes. Chemosphere 28: 253-259. http://dx.doi.org/10.1016/0045-6535(94)90122-8

Gan, D; Dupont, R. (1989). Hazard Waste Hazard Materials (pp. 363-383).

Geiger, DL; Northcott, CE; Call, DJ; Brooke, LT. (1985). Acute toxicities of organic chemicals to fathead minnows (Pimephales promelas): Volume II. Superior, WI: University of Wisconsin-Superior, Center for Lake Superior Environmental Studies.

Geiger, DL; Poirier, SH; Brooke, LT; Call, DJ. (1986). Acute toxicities of organic chemicals to fathead minnows (Pimephales promelas): Volume III. Superior, WI: University of Wisconsin-Superior, Center for Lake Superior Environmental Studies.

Hansch, C; Leo, A; Hoekman, D. (1995). Exploring QSAR: Hydrophobic, electronic, and steric constants. Washington, DC: American Chemical Society.

Haynes, WM; Lide, DR; Bruno, TJ. (2014). CRC handbook of chemistry and physics (95th ed.). Boca Raton, FL: CRC Press.

Heitmuller, PT; Hollister, TA; Parrish, PR. (1981). Acute toxicity of 54 industrial chemicals to sheepshead minnows (Cyprinodon variegatus). Bulletin of environmental contamination and toxicology 27: 596-604. http://dx.doi.org/10.1007/BF01611069

Horvath, AL; Getzen, FW; Maczynska, Z. (1999). IUPAC-NIST solubility data series 67: Halogenated ethanes and ethenes with water. J Phys Chem Ref Data 28: 395-627. http://dx.doi.org/10.1063/1.556039

HSDB (Hazardous Substances Data Bank,). (2008). 1,1,2-Trichloroethane. CASRN: 79-00-5. Washington D.C.: National Library of Medicine. http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@DOCNO+6124

Hulzebos, EM; Adema, DMM; Dirven-Van Breemen, EM; Henzen, L; van Dis, WA; Herbold, HA; Hoekstra, JA; Baerselman, R; van Gestel, CAM. (1993). Phytotoxicity studies with Lactuca sativa in soil and nutrient solution. Environmental Toxicology and Chemistry: An International Journal 12: 1079-1094. http://dx.doi.org/10.1002/etc.5620120614

IARC (International Agency for Research on Cancer,). (1991). IARC monographs on the evaluation of carcinogenic risks to humans [IARC Monograph]. In IARC monographs on the evaluation of carcinogenic risks to humans (pp. 337-359). Geneva: World Health Organization, International Agency for Research on Cancer. https://monographs.iarc.fr/wp-content/uploads/2018/06/mono52-15.pdf

IARC (International Agency for Research on Cancer). (1999). Re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide. In IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon, France: World Health Organization. https://monographs.iarc.fr/wp-content/uploads/2018/06/mono71.pdf

ICES (International Council for the Exploration of the Sea). (2018). ICES-Dome [Database]. Retrieved from http://www.ices.dk/marine-data/data-portals/Pages/DOME.aspx

LeBlanc, GA. (1980). Acute toxicity of priority pollutants to water flea (Daphnia magna). Bulletin of environmental contamination and toxicology 24: 684-691. http://dx.doi.org/10.1007/BF01608174

Leighton, DT; Calo, JM. (1981). Distribution coefficients of chlorinated hydrocarbons in dilute air-water systems for groundwater contamination applications. Journal of Chemical and Engineering Data 26: 382-585. http://dx.doi.org/10.1021/je00026a010

Lide, D; Milne, G. (1994). Handbook of data on organic compounds (3rd ed.). Boca Raton, FL: CRC Press, Inc.

Mackay, D; Shiu, WY; Ma, KC; Lee, SC. (2006). Handbook of physical-chemical properties and environmental fate for organic chemicals CAS RN: 115-96-8. Boca Raton, FL: CRC press.

MDI (MDI Biological Laboratory). (2002). Comparative Toxicogenomics Database (CTD) [Database]. Retrieved from http://ctdbase.org

Miyagawa, M; Takasawa, H; Sugiyama, A; Inoue, Y; Murata, T; Uno, Y; Yoshikawa, K. (1995). The in vivo-in vitro replicative DNA synthesis (RDS) test with hepatocytes prepared from male B6C3F1 mice as an early prediction assay for putative nongenotoxic (Ames-negative) mouse hepatocarcinogens. Mutation Research/Genetic Toxicology 343: 157-183. http://dx.doi.org/10.1016/0165-1218(95)90082-9

NBOS (National Bureau of Standards,). (1951). Table of dielectric constants of pure liquids. U.S. Department of Commerce, National Bureau of Standards. May 9, 2019 https://apps.dtic.mil/dtic/tr/fulltext/u2/a278956.pdf.

NCI (National Cancer Institute). (1978). Bioassay of 1,1,2-trichloroethane for possible carcinogenicity, CAS no. 79-00-5. (NCI-CG-TR-74). Bethesda, MD: National Institutes of Health, National Cancer Institute, Division of Cancer Cause and Prevention. https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr074.pdf

Neuhauser, EF; Loehr, RC; Malecki, MR; Milligan, DL; Durkin, PR. (1985). The toxicity of selected organic chemicals to the earthworm Eisenia fetida. Journal of Environmental Quality 14: 383-388.

NITE (National Institute of Technology and Evaluation,). (2010). Japan CHEmicals Collaborative Knowledge database (J-CHECK). CASRN: 79-00-5. Available online at https://www.nite.go.jp/chem/jcheck/detail.action?cno=79-00-5&mno=2-0055&request_locale=en

OECD (Organisation for Economic Co-operation and Development). (2000). SIDS initial assessment report: 1,1,2 trichloroethane. Tokyo, Japan. http://www.inchem.org/documents/sids/sids/79005.pdf

OECD (Organisation for Economic Co-operation and Development). (2003). Assessment report for post-SIDS testing results: 1,1,2 trichloroethane. Paris, France. http://www.inchem.org/documents/sids/sids/TRICHLOROET.pdf

OECD (Organisation for Economic Co-operation and Development). (2018). OECD Monitoring Database [Database]. http://www.oecd.org

O'Neil, MJ; Heckelman, PE; Dobbelaar, PH; Roman, KJ; Kenney, CM; Karaffa, LS. (2013). The Merck index: An encyclopedia of chemicals, drugs, and biologicals (15th ed.). Cambridge, U.K.: The Royal Society of Chemistry.

Parrish, C. (1983). Solvents, industrial. In Kirk-Othmer Encyclopedia of Chemical Technology (3rd ed.). New York, NY: John Wiley and Sons.

Rajendran, S. (1990). The toxicity of phosphine, methyl bromide, 1,1,1-trichloroethane and carbon dioxide alone and as mixtures to the pupae of red flour beetle, Tribolium castaneum Herbst. Pesticide science 29: 75-84. http://dx.doi.org/10.1002/ps.2780290110

Rathbun, RE. (1998). Transport, behavior, and fate of volatile organic compounds in streams (pp. 1-151). (U.S. Geological Survey Professional Paper 1589). U.S. Geological Survey

Riddick, JA; Bunger, WB; Sakano, TK. (1986). Techniques of organic chemistry: Organic solvents: Physical properties and methods of purification (4th ed.). New York, NY: Wiley-Blackwell.

Roghair, CJ; Buijze, A; Yedema, ESE; Hermens, JLM. (1994). A QSAR for base-line toxicity to the midge Chironomus riparius. Chemosphere 28: 989-997.

Sanchez-Fortun, S; Sanz, F; Santa-Maria, A; Ros, JM; De Vicente, ML; Encinas, MT; Vinagre, E; Barahona, MV. (1997). Acute sensitivity of three age classes of Artemia salina larvae to seven chlorinated solvents. Bulletin of environmental contamination and toxicology 59: 445-451. http://dx.doi.org/10.1007/s001289900498

Smith, AD; Bharath, A; Mallard, C; Orr, D; Smith, K; Sutton, JA; Vukmanich, J; McCarty, LS; Ozburn, GW. (1991). The acute and chronic toxicity of ten chlorinated organic compounds to the American flagfish (Jordanella floridae). Archives of environmental contamination and toxicology 20: 94-102. http://dx.doi.org/10.1007/BF01065334

SYKE (The Finnish Environment Institute,). (2018). Data bank of environmental properties of chemicals 1,1,2-Trichloroethane, CAS RN: 79-00-5. The Finnish Environment Institute. http://wwwp.ymparisto.fi/scripts/Kemrek/Kemrek_uk.asp?Method=MAKECHEMdetailsform&txtChemId=298

Tabak, HH; Quave, SA; Mashni, CI; Barth, EF. (1981). Biodegradability studies with organic priority pollutant compounds. J Water Pollut Control Fed 53: 1503-1518.

Thompson, RS; C, NG. (1989). 1,1,1-Trichloroethane: Medium-term toxicity to carp, daphnids, and higher plants. Ecotoxicology and environmental safety 17: 172-182. http://dx.doi.org/10.1016/0147-6513(89)90036-5

Torkelson TR; Rowe VK. (1981). Patty's industrial hygiene and toxicology. In GD Clayton; FE Clayton (Eds.), (3rd ed., pp. 3586-3593). New York, NY: John Wiley & Sons Inc.

Tsai, KP; Chen, CY. (2007). An algal toxicity database of organic toxicants derived by a closed-system technique. Environmental Toxicology and Chemistry: An International Journal 26: 1931-1939. http://dx.doi.org/10.1897/06-612R.1

U.S. EPA. (U.S. Environmental Protection Agency). (1987). Integrated Risk Information System (IRIS), chemical assessment summary, 1,1,2-Trichloroethane; CASRN 79-00-5. Washington, DC: U.S. Environmental Protection Agency, National Center for Environmental Assessment. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0198_summary.pdf

U.S. EPA (U.S. Environmental Protection Agency). (1990). EPA Ambient Monitoring Technology Information Center (AMTIC): Air toxics data [Database]. Retrieved from https://www3.epa.gov/ttnamti1/toxdat.html

U.S. EPA (U.S. Environmental Protection Agency). (1996). EPA Unregulated Contaminant Monitoring Rule (UCMR) [Database]. Retrieved from https://www.epa.gov/dwucmr

U.S. EPA (U.S. Environmental Protection Agency). (2006). Targeted National Sewage Sludge Survey (TNSSS) [Database]. Retrieved from https://www.epa.gov/biosolids/sewage-sludge-surveys

U.S. EPA (U.S. Environmental Protection Agency). (2007). EPA Discharge Monitoring Report Data (EPA DMR) [Database]. Retrieved from https://cfpub.epa.gov/dmr/

U.S. EPA (U.S. Environmental Protection Agency). (2011). Provisional peer-review toxicity values for 1,1,2-trichloroethane (CASRN 79-00-5). Cincinnati, OH: U.S. Environmental Protection Agency, National Center for Environmental Assessment, Superfund Health Risk Technical Support Center. https://hhpprtv.ornl.gov/issue_papers/Trichloroethane112.pdf

U.S. EPA (U. S. Environmental Protection Agency). (2012). Estimation Programs Interface Suite for Microsoft Windows, v. 4.11 [Computer Program]. https://www.epa.gov/tsca-screening-tools/download-epi-suitetm-estimation-program-interface-v411

U.S. EPA (U.S. Environmental Protection Agency). (2015). Technical support document, EPA's 2011 National-scale Air Toxics Assessment, 2011 NATA TSD. Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards. https://www.epa.gov/sites/production/files/2015-12/documents/2011-nata-tsd.pdf

U.S. EPA (U.S. Environmental Protection Agency) (2017). Chemical Data Reporting (2012 and 2016 Public CDR database). Washington, DC. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. Retrieved from ChemView: June 2019.

U.S. EPA (U.S. Environmental Protection Agency). (2018a). ECOTOXKnowledgebase. Washington, DC: U.S. Environmental Protection Agency. https://cfpub.epa.gov/ecotox/

U.S. EPA (U.S. Environmental Protection Agency). (2018b). Great Lakes Environmental Database (GLENDA) [Database]. Retrieved from https://www.epa.gov/great-lakes-monitoring/great-lakes-fish-monitoring-surveillance-program-data

U.S. EPA (U.S. Environmental Protection Agency) (2019a). Chemical Data Reporting (2012 and 2016 CBI CDR database). Washington, DC. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. Retrieved: April 25, 2019.

U.S. EPA (U.S. Environmental Protection Agency). (2019b). Chemical and Products Database (CPDat). Available online at https://www.epa.gov/chemical-research/chemical-and-products-database-cpdat

U.S. EPA (U.S. Environmental Protection Agency). (2019c). Envirofacts Toxics Release Inventory 2017 Updated Dataset (released April 2019) https://www.epa.gov/enviro/tri-customized-search

USGS (U.S. Geological Survey). (1991a). USGS Monitoring Data: National Water Quality Monitoring Council [Database]. Retrieved from https://www.waterqualitydata.us/portal

USGS (U.S. Geological Survey). (1991b). USGS Monitoring Data: National Water Quality Monitoring Council - Air [Database]. Retrieved from https://www.waterqualitydata.us/portal/#sampleMedia=Air&mimeType=csv

USGS (U.S. Geological Survey). (1991c). USGS Monitoring Data: National Water Quality Monitoring Council - Groundwater [Database]. Retrieved from

https://www.waterqualitydata.us/portal/#siteType=Aggregate%20groundwater%20use&sampleMedia=Water&mimeType=csv&dataProfile=activityAll

USGS (U.S. Geological Survey). (1991d). USGS Monitoring Data: National Water Quality Monitoring Council - Sediment [Database]. Retrieved from https://www.waterqualitydata.us/portal/#sampleMedia=Sediment&mimeType=csv

USGS (U.S. Geological Survey). (1991e). USGS Monitoring Data: National Water Quality Monitoring Council - Soil [Database]. Retrieved from https://www.waterqualitydata.us/portal/#sampleMedia=Soil&mimeType=csv

USGS (U.S. Geological Survey). (1991f). USGS Monitoring Data: National Water Quality Monitoring Council - Surface Water [Database]. Retrieved from https://www.waterqualitydata.us/portal/#siteType=Aggregate%20surface-water-use&sampleMedia=Water&mimeType=csv

USGS (U.S. Geological Survey). (1991g). USGS Monitoring Data: National Water Quality Monitoring Council - Tissue [Database]. Retrieved from https://www.waterqualitydata.us/portal/#sampleMedia=Tissue&mimeType=csv

Engineering Sciences Data Unit, (ESD). (1976). Vapor pressures and critical points of liquids. VII. Halogenated ethanes and ethylenes. In Eng Sci Data Item 76004.

Verschueren, K. (1983). Handbook of environmental data on organic chemicals (2nd ed.). New York, NY: Van Nostrand Reinhold Company.

Verschueren, K. (2001). Handbook of environmental data on organic chemicals (4th ed.). New York, NY: John Wiley & Sons, Incorporated.

Walbridge, CT; Fiandt, JT; Phipps, GL; Holcombe, GW. (1983). Acute toxicity of ten chlorinated aliphatic hydrocarbons to the fathead minnow (Pimephales promelas). Archives of environmental contamination and toxicology 12: 661-666.