United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Proposed Designation of *p*-Dichlorobenzene (CASRN 106-46-7) 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
Biomon.	Biomonitoring
BOD	Biochemical 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
Concen.	Concentration
CWA	Clean Water Act
CPDat	Chemical and Products Database
ECOTOX	Ecotoxicology Database
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
FDA	U.S. Food and Drug Administration
FR	Federal Register
GC	Gas chromatography
HPLC	High performance liquid chromatography
IRIS	Integrated Risk Information System
IUR	Inventory Update Rule
K	Thousand
K_{OC}	Organic carbon-water partition coefficient
K_{OW}	Octanol-water partition coefficient
M	Million

Term	Description
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MITI	Ministry of International Trade and Industry
MP	Melting point
NAICS	North American Industry Classification System
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NR	Not reported
OECD	Organisation for Economic Co-operation and Development
·OH	Hydroxyl radical
OPPT	Office of Pollution Prevention and Toxics
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
POTW	Publicly owned treatment works
PPE	Personal protective equipment
PPM	Parts per million
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
RY	Reporting Year
SOP	Standard Operating Procedure
SMILES	Simplified Molecular-Input Line-Entry System
$T_{1/2}$	Half-life
TBD	To be determined
TG	Test guidance
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	Time weighted average

Term	Description
USGS	United States Geological Survey
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 (EPA'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[1] for a may present 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).

p-Dichlorobenzene 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 *p*-dichlorobenzene 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

[1] For 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

considerations as well as review of the reasonably available information on *p*-dichlorobenzene, 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 *p*-dichlorobenzene as a high-priority substance for risk evaluation. The docket number for providing comments on *p*-dichlorobenzene is EPA-HQ-OPPT-2018-0446 and is available at www.regulations.gov.

The information, analysis, and basis used 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 children, pregnant women, and workers, who could be potentially exposed or susceptible subpopulations for 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 *p*-dichlorobenzene 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 in order 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
***p*-Dichlorobenzene (106-46-7)**	10M to 50M	50M to 100M	50M to 100M	50M to 100M	50M to 100M	10M to 50M	50M to 100M	50M to 100M	50M to 100M	50M to 100M	50M to 100M

K = thousand, M = million, B = billion
Reference: U.S. EPA (2013) and U.S. EPA (2017)

Production volume of *p*-dichlorobenzene in 2015, as reported to EPA during the 2016 CDR reporting period, was 50,000,000 to 100,000,000 pounds. Production volume of *p*-dichloro-benzene as reported to EPA increased from 1986 to 2011. The range in the reported production volume from 2012 to 2015 has not changed.

[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 *p*-dichlorobenzene 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). 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 and 6. For 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 included generic use information.

Table 2. *p*-Dichlorobenzene (106-46-7) Categories and Subcategories of Conditions of Use[5] (2016 CDR Reporting Cycle)

Life Cycle Stage	Category	Subcategory	Reference
Manufacture	Domestic manufacture/Import	CBI[6]	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	Processing – as a reactant	Intermediates in Plastic material and resin manufacturing	U.S. EPA (2019a)
	Processing – incorporation into formulation, mixture or reaction product	Intermediates in Plastic material and resin manufacturing	U.S. EPA (2019a)
	Processing – incorporating into article	Intermediates in Pesticide, fertilizer, and other agricultural chemical manufacturing	U.S. EPA (2019a)
	Processing – incorporating into article	Odor Agents in Wholesale and retail trade.	U.S. EPA (2019a)
	Recycling	Recycling	
Distribution in Commerce [a, b]	Distribution in commerce		
Commercial	Automotive care products	Automotive Care Products	U.S. EPA (2019a)
	Non-TSCA use	Non-TSCA Use	U.S. EPA (2019a)
Consumer	Automotive care products	Automotive Care Products	U.S. EPA (2019a)
	Non-TSCA use	Non-TSCA Use	U.S. EPA (2019a)
	Air care products	Air care products	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.

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

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

Table 3. *p*-Dichlorobenzene (106-46-7) Categories and Subcategories of Conditions of Use[7] (2012 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory of Use	Reference
Manufacture	Import	Import	U.S. EPA (2019a)
Processing	Processing as a reactant	Intermediates in Plastics Material and Resin Manufacturing	U.S. EPA (2019a)
	Processing – incorporating into formulation, mixture or reaction product	Odor agents in: Other (requires additional information)	U.S. EPA (2019a)
	Processing – incorporating into article	Odor agents in Wholesale and Retail Trade	U.S. EPA (2019a)
	Recycling	Recycling	U.S. EPA (2019a)
Distribution in commerce [a,b]	Distribution in commerce		
Commercial	Air care products	Air care products	U.S. EPA (2019a)
Consumer	Air care products	Air care products	U.S. EPA (2019a)
Disposal [a]	Disposal		

[a] CDR includes information on the manufacturing, processing, and use of chemicals. 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.

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 *p*-Dichlorobenzene, Reporting Year 2011

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Import	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
	Produce or import for on-site use/processing	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256

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

Activity Type	Activity	Industry Group	NAICS Code
	Produce or import for sale/distribution	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
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	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
	Process as a formulation component	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
	Process – repackaging	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Waste Treatment and Disposal	5622
Otherwise Use	Otherwise use – ancillary or other use	Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		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
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622
	Energy recovery	Basic Chemical Manufacturing	3251
		Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622
	Recycling	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253

Activity Type	Activity	Industry Group	NAICS Code
		Other Nonmetallic Mineral Product Manufacturing	3279
	Treatment	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622

Reference: U.S. EPA, 2019b

Table 5. Activities and Uses Reported to TRI for *p*-Dichlorobenzene, Reporting Year 2015

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
		Waste Treatment and Disposal	5622
	Import	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
	Produce or import for on-site use/processing	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
	Produce or import as a byproduct	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Waste Treatment and Disposal	5622
	Produce or import as an impurity	Basic Chemical Manufacturing	3251
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	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Waste Treatment and Disposal	5622

Activity Type	Activity	Industry Group	NAICS Code
	Process as a formulation component	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
	Process – repackaging	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Waste Treatment and Disposal	5622
Otherwise Use	Otherwise use – ancillary or other use	Basic Chemical Manufacturing	3251
		Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		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
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622
	Energy recovery	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Cement and Concrete Product Manufacturing	3273
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622
	Recycling	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Nonmetallic Mineral Product Manufacturing	3279
	Treatment	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Soap, Cleaning Compound, and Toilet Preparation Manufacturing	3256
		Other Nonmetallic Mineral Product Manufacturing	3279

Activity Type	Activity	Industry Group	NAICS Code
		Waste Treatment and Disposal	5622

Reference: U.S. EPA, 2019b

Table 6. Activities and Uses Reported to TRI for *p*-Dichlorobenzene, 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
	Import	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
	Produce or import for on-site use/processing	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
	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
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	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
	Process – repackaging	Waste Treatment and Disposal	5622
Otherwise Use	Otherwise use – ancillary or other use	Basic Chemical Manufacturing	3251
		Other Nonmetallic Mineral Product Manufacturing	3279
		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
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622
	Energy recovery	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Other Nonmetallic Mineral Product Manufacturing	3279
	Recycling	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Waste Treatment and Disposal	5622
	Treatment	Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Nonmetallic Mineral Product Manufacturing	3279
		Waste Treatment and Disposal	5622

Reference: U.S. EPA, 2019b

CDR and TRI Summary and Additional Information on Conditions of Use

As reported to the 2012 and 2016 CDR, domestic manufacture/import and import of *p*-dichlorobenzene were claimed as CBI.[8] In the 2016 CDR, the chemical was reported as processed in several ways; incorporated into formulation, mixture or reaction products; as a reactant; incorporated into articles; and recycling. In 2016, two sites reported use of the chemical in processing as a reactant in plastic material and resin manufacturing (intermediates). One site reported processing – incorporation into an article (intermediates) in pesticide, fertilizer and other agricultural chemical manufacturing. One site reported processing – incorporation into article (intermediates) in wholesale and retail trade. Also, in 2016, one site reported processing – incorporation into formulation, mixture or reaction product (intermediates) in plastic material and resin manufacturing. For the 2012 CDR, two sites reported processing of *p*-dichlorobenzene as a reactant (intermediates) in plastics material and resin manufacturing. One site reported use of the chemical in processing – incorporation into formulation, mixture or reaction product (odor agents) in other industrial sector. Another site also reported processing—incorporation into article (odor agents) in wholesale and retail trade.

Consumer and commercial uses were reported for *p*-dichlorobenzene to CDR in 2012 and 2016. In 2016, one site reported both commercial and consumer uses of the chemical in automotive care products. One site reported both commercial and consumer uses of the chemical in non-TSCA use in 2016. One site reported consumer uses of *p*-dichlorobenzene in air care products in 2016. In 2012 CDR, two sites reported both commercial and consumer use of *p*-dichlorobenzene in air care products. Consumer uses were also identified in additional databases, which are included in the Exposure Potential section (Section 8).

[8] 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 included generic use information.

There were no reports to CDR of any use of *p*-dichlorobenzene in children's products.

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 Reporting Year 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. Table 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 include all industry groups that reported to TRI using each waste management activity for p-dichloro-benzene.

During the first public comment period for the draft high-priority designation of *p*-dichloro-benzene, a public comment from one product manufacturer provided additional information on the use of their products, especially the "most commonly used toilet and urinal deodorizers/ fresheners in the marketplace." Another public comment stated that specific aerospace industrial uses include, but may not be limited to, products or formulations for the manufacture, operation and maintenance of aerospace products, as a constituent in oils, and as a component of automotive engine oils used in facilities and oils to maintain tools. The uses may be qualified for use in federal, military, industry and company proprietary specifications (EPA-HQ-OPPT-2018-0446).

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 or other susceptible subpopulation may be potentially exposed. EPA also used human health hazard information to identify potentially exposed or susceptible subpopulations.

Results and Discussion

At this stage, EPA identified children, women of reproductive age, consumers and workers as subpopulations who may be potentially exposed or susceptible subpopulations for *p*-dichlorobenzene.

Children

EPA used data reported to the 2012 and 2016 CDR to identify uses in products and articles intended for children over time for *p*-dichlorobenzene. The 2012 and 2016 CDR did not report any use in children's products. However, EPA identified potential developmental hazards that would impact any stage of children's development

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

EPA identified studies that observed developmental effects following exposure to *p*-dichlorobenzene (Section 7, Table 9). Although no reproductive hazards were observed in the identified studies (Table 9), EPA considers women of reproductive age as potentially exposed. During the scoping and risk evaluation process, reproductive hazards will be considered again following a systematic search of the relevant scientific literature.

Consideration of women of reproductive age as a potentially exposed or susceptible subpopulation was also based on exposure because women of reproductive age are potential workers in the manufacturing, processing, distribution in commerce, use, or disposal of the chemical substance.

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 a 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 data, such as physical and chemical properties and environmental fate characteristics, to understand p-dichlorobenzene'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 p-dichlorobenzene, respectively.

Results and Discussion
p-Dichlorobenzene is a volatile, water-soluble liquid (81.3 mg/L). Measured Henry's Law constant (2.41×10^{-3} atm-m^3/mol) and vapor pressure (1.74 mm Hg) data indicate that this chemical is not likely to persist in surface water or soil as it will likely volatilize upon release. In the air, *p*-dichlorobenzene is expected to exist in the vapor phase where it may react with photochemically produced hydroxyl radicals at a rate corresponding to a half-life of 33 days. It is not expected to be susceptible to direct photodegradation.

In aerobic aquatic environments, *p*-dichlorobenzene has the potential to biodegrade under certain conditions. In water, this chemical reached 67 percent degradation over a 28-day incubation period using activated sludge and the Organisation for Economic Co-operation and Development (OECD) 301D test method and met the 10-day window at an initial test substance concentration of 1.9 mg/L. However, this chemical showed no biodegradation over a 28-day incubation period

using activated sludge and the OECD 301C test method at higher test substance concentrations (100 mg/L). It is not expected to be susceptible to hydrolysis in an aqueous environment. *p*-Dichlorobenzene may biodegrade slowly under certain environmental conditions in soils and sediments. In soil, it reached 25 and 90 percent degradation after 300 days using anaerobic soil and 6.3 percent degradation after 10 weeks using an alkaline soil. In anaerobic environments, *p*-dichlorobenzene is not expected to be biodegradable. No biotransformation was observed after 12 months using anaerobic sediments. These data suggest that *p*-dichlorobenzene may have moderate persistence in subsurface environments or groundwater.

This chemical has the potential for low bioaccumulation based on measured bioconcentration factors in carp (33–190), rainbow trout (370–720), mosquito fish (78), bluegill (60), and guppy (1,800) and a bioaccumulation factor estimate of 281.

Table 7. Physical and Chemical Properties of *p*-Dichlorobenzene

Property or Endpoint	Value[a]	Reference
Molecular Formula	$C_6H_4C_{l2}$	CRC Handbook (Haynes, 2014)
Molecular Weight	147.002 g/mole	CRC Handbook (Haynes, 2014)
Physical State	Solid	HSDB (2018)
Melting Point	52.09 ºC[b]	PhysProp Database (U.S. EPA, 2012b)
	52.8–53.5 ºC	ECHA (2004)
	53.1 ºC	HSDB (2018) citing Larranaga et al. (2016); CRC Handbook (Haynes, 2014)
	Sublimes	O'Neil (2013); ATSDR (2006); HSDB (2018)
Boiling Point	174 °C[b]	PhysProp Database (U.S. EPA, 2012b)
	173–174 ºC	ECHA (2004)
Density	1.46 at 20 ºC	O'Neil (2013)
	1.25–1.46 g/cm^3 at 20 ºC; 1.23 g/cm^3 at 70 ºC	ECHA (2004)
	1.2475 g/cm^3	CRC Handbook (Haynes, 2014)
Vapor Pressure	1.74 mm Hg at 25 ºC[b]	PhysProp Database (U.S. EPA, 2012b) citing Daubert and Danner (1989)
	0.40 mm Hg at 25 ºC	ECHA (2019) citing Budavari (2001)
	1.20–1.28 mm Hg at 2 ºC; 9.98 mm Hg at 54.8 ºC	ECHA (2004)
	0.4 mm Hg at 25 ºC	O'Neil (2013)
Vapor Density	5.08 g/L (relative vapor density to air = 1)	HSDB (2018) citing Lewis (2012)

Property or Endpoint	Value[a]	Reference
Water Solubility	81.3 mg/L at 25 ºC[b]	PhysProp Database (U.S. EPA, 2012b) citing Yalkowsky and He (2003)
	60–70 mg/L at 20 ºC	ECHA (2004)
Log K_{OW}	3.44[b]	PhysProp Database (U.S. EPA, 2012b) citing Hansch et al. (1995)
	3.37 ± 0.04 at 25 ºC and pH ca. 7	ECHA (2019) citing Wasik (1983)
	3.37–3.39	ECHA (2004)
Henry's Law Constant	2.41 × 10-3 atm-m^3/mol at 25 ºC[b]	PhysProp Database (U.S. EPA, 2012b) citing Shiu and Mackay (1997)
	2.120 × 10-3 atm-m^3/mol at 10 ºC; 2.590 × 10-3 atm-m^3/mol at 20 ºC; 3.170 × 10-3 atm-m^3/mol at 25 ºC	ECHA (2019) citing Ashworth (1988)
	2.48 × 10-3 atm-m^3/mol at 20 ºC	CRC Handbook (Haynes, 2014)
	2.45 to 2.67 × 10^{-3} atm-m3/mol at 20 ºC	ECHA (2004)
Flash Point	66 ºC (closed cup)	ECHA (2004), HSDB (2018)
Auto Flammability	No auto flammability up to 500 ºC	ECHA (2004), ECHA (2019) citing Krishnamurti (2001)
Viscosity	0.839 mPa·s at 55 ºC; 0.668 mPa·s at 79 ºC	HSDB (2018) citing Dean (1987)
Refractive Index	1.5285 at 20 ºC	CRC Handbook (Haynes, 2014)
Dielectric Constant	2.3943 at 328.2 ºK	CRC Handbook (Haynes, 2014)

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

Table 8. Environmental Fate Characteristics of *p*-Dichlorobenzene

Property or Endpoint	Value[a]	Reference
Direct Photodegradation	Does not contain chromophores that absorb at wavelengths >290 nm; not expected to undergo direct photolysis by sunlight	HSDB (2018)
Indirect Photodegradation	$T_{1/2}$ = 33 days (based on 12-hour day with 1.5×10^6 ·OH/cm^3 and OH rate constant 3.2×10^{-13} cm^3/mol-second at 25 ºC)	PhysProp Database (U.S. EPA, 2012b) citing Atkinson (1989)
Hydrolysis	Stable; *p*-dichlorobenzene is not expected to undergo hydrolysis based on its chemical structure, which lacks functional groups known to undergo hydrolysis under environmental conditions	HSDB (2018)
Biodegradation (Aerobic)	Water: 0%/28 days based on theoretical BOD and HPLC using an activated sludge inoculum (Japanese MITI test; improved for a volatile substance; initial test substance concentration of 100 mg/L)	HSDB (2018) citing NITE (2010)
	Water: 80%/ 28 days mineralization and 30%/28 days with initial test substance concentrations of 8 and 40 mg/L, respectively (test comparable to MITI [I] test) 1.4%/8 days, 49.5%/15 days, and 67%/28 days based on test substance analysis and initial test substance concentration of 1.9 mg/L (OECD 301D, closed bottle test); *p*-dichlorobenzene meets the 10-day window and is readily biodegradable at lower concentrations but toxic effect at higher concentrations is likely	ECHA (2004)
	Soil: 6.3%/10 weeks based on theoretical CO_2 evolution in an alkaline soil sample reported for dichlorobenzene isomers	HSDB (2018) citing Haider et al. (1974)
	Sediment: 25 and 90%/300 days incubation in soil column experiments with sediment from the Rhine River	HSDB (2018) citing van der Meer et al. (1992)
Biodegradation (Anaerobic)	Sediment: no biotransformation/12 months in anaerobic Rhine River sediment column	HSDB (2018) citing Bosma et al. (1990)
	Groundwater: 7.4 mg/m^3/day biodegradation rate in vadose zone in New Jersey measured above polluted groundwater at DuPont Chambers Works	HSDB (2018) citing Kurt et al. (2013)
Wastewater Treatment	76% total removal (46% by biodegradation, 7.1% by sludge, and 23% by volatilization to air; estimated)[b]	U.S. EPA (2012a)
Bioconcentration Factor	370–720 (rainbow trout) 78 (mosquito fish)	HSDB (2018) citing Chaisukant (1997) and Oliver and Niimi (1983)

Property or Endpoint	Value[a]	Reference
	33–190 (*Cyprinus carpio*; OECD 305)	NITE (2010)
	Ranged from 60 (*Lepomis macrochirus*; whole-body wet weight) to 1,800 (*Poecilia reticulata*; total lipid content and BCF of 270 based on whole-body dry weight)	ECHA (2019) (range from eight study summaries)
Bioaccumulation Factor	281 (estimated)[b]	U.S. EPA (2012a)
Soil Organic Carbon:Water Partition Coefficient (Log K_{OC})	2.44 (K_{OC} = 273; batch equilibrium method equivalent to OECD 106)	ATSDR (2006) citing Chiou et al. (1983); ECHA (2019)

Notes:
[a]Measured unless otherwise noted
[b]EPI Suite™ physical property inputs: Log K_{OW} = 3.44, BP = 174 ºC, MP = 52.09 ºC, VP = 1.74 mm Hg, WS = 81.3 mg/L, HLC = 0.00241 atm-m^3/mol, STP Exp. biodeg values of BIOP = 40, BioA = 10 and BioS = 10, SMILES c(ccc(c1)Cl)(c1)Cl
·OH = hydroxyl radical; HPLC = high performance liquid chromatography; BOD = biological oxygen demand; OECD = Organisation for Economic Cooperation and Development; MITI = Ministry of International Trade and Industry

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

p-Dichlorobenzene is a designated toxic pollutant under Section 307(a)(1) of the CWA and as such is subject to effluent limitations. It is also a Priority Pollutant under the CWA and has Ambient Water Quality Criteria (AWQC). *p*-Dichlorobenzene is subject to the National Primary Drinking Water Regulations under the SDWA with a Maximum Contaminant Level Goal (MCLG) of 0.075 (mg/L) and an enforceable Maximum Contaminant Level (MCL) of 0.075 (mg/L).

p-Dichlorobenzene is subject to reporting requirements under the EPCRA. It is also considered a CERCLA hazardous substance and releases in quantities equal to or greater than 100 pounds are subject to reporting to the National Response Center under the CERCLA. *p*-Dichlorobenzene is listed on the Superfund Amendments and Reauthorization Act (SARA) and the CERCLA Priority List of Hazardous Substances.

p-Dichlorobenzene is also subject to the Resource Conservation and Recovery Act (RCRA; hazardous waste number D027 and U072). 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 identify potential human health and environmental hazards for *p*-dichlorobenzene (Tables 9 and 10, respectively).

EPA/OPPT 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)[9]. The environmental hazard information was populated in ECOTOX and is available for 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 *p*-dichlorobenzene, if available, to fill in potential data gaps when there were no reported observed effects for specific taxa exposed to the *p*-dichlorobenzene (Table 10).

Potential Human Health and Environmental Hazard Tables

EPA identified potential human health and environmental hazards based on a review of the reasonably available information for *p*-dichlorobenzene (Table 9 and Table 10, respectively).

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

Table 9. Potential Human Health Hazards Identified for *p*-Dichlorobenzene

Human Health Hazards	Tested for a Specific Effect?	Specific Effect Observed	Data Source
Acute Toxicity	X	X	ATSDR (2006), ECHA (2004), NICNAS (2000), CalEPA (1997)
Repeated Dose Toxicity	X	X	ATSDR (2006), NTP (1987), ECHA (2004), RIVM (2001), NICNAS (2000), CalEPA (1997), U.S. EPA (1994)
Genetic Toxicity	X		ATSDR (2006), ECHA (2004), OECD (2003), RIVM (2001), NICNAS (2000), IARC (1999), RIVM (1991), U.S. EPA (1994), NTP (1987)
Reproduction Toxicity	X		ATSDR (2006), ECHA (2004), IARC (1999), U.S. EPA (1994)
Developmental Toxicity	X	X	ATSDR (2006), IARC (1999), RIVM (1991)
Toxicokinetic	X	X	ATSDR (2006), ECHA (2004), NICNAS (2000)
Irritation/Corrosion	X	X	ATSDR (2006), ECHA (2004), NICNAS (2000), CalEPA (1997), RIVM (1991)
Dermal Sensitization	X		ECHA (2004), NICNAS (2000), U.S. EPA (1994)
Respiratory Sensitization	X		CalEPA (2009), ECHA (2004), NICNAS (2000), U.S. EPA (1994)
Carcinogenicity	X	X	NTP (2016), U.S. EPA (2014), ATSDR (2006), ECHA (2004), OECD (2003), NICNAS (2000), IARC (1999), U.S. EPA (1994), NTP (1987)
Immunotoxicity			
Neurotoxicity	X	X	ATSDR (2006), ECHA (2004), CalEPA (2008), NICNAS (2000), CalEPA (1997), U.S. EPA (1994), NTP (1987)
Epidemiological Studies or Biomonitoring Studies	X	X	ATSDR (2006), ECHA (2004), NICNAS (2000), IARC (1999), CalEPA (1997), NTP (1987)

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 *p*-Dichlorobenzene

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate p-Dichlorobenzene (CASRN 106-46-7)		Isomers of *p*-Dichlorobenzene (CASRN 106-46-7) o-Dichlorobenzene (CASRN 95501) m-Dichlorobenzene (CASRN 541731) Dichlorobenzene (CASRN 25321226)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
Aquatic	Acute exposure	Vegetation	10	X	13	X	Altenburger et al. (2004); Casserly et al. (1983); Figueroa and Simmons (1991); Figueroa (1990); Galassi and Vighi (1981); Kuhn and Pattard (1990); Ma et al. (1997); Nendza and Wenzel (2006); Tsai and Chen (2007);Wong et al. (1984); Zhang et al. (2016); Zhang et al. (2017)
		Invertebrate	11	X	17	X	Abernethy et al. (1986); Bobra et al. (1983); Butler et al. (1960); Call et al. (1979b), Call et al. (1980); Call et al. (1983); Curtis and Ward (1981); Curtis et al. (1979); Davis and Hidu (1969); Gersich et al. (1986); Kuhn et al. (1989); LeBlanc (1980); Lindley et al. (1999); Mortimer and Connell (1995); Radix et al. (1999); Roghair et al. (1994); Yoshioka et al. (1985)
		Fish	20	X	19	X	Ahmad et al. (1984); Buccafusco et al. (1981); Call et al. (1979a); Call et al. (1979b); Call et al. (1983); Carlson and Kosian (1987); Chaisuksant et al. (1997); Curtis and Ward (1981);Curtis et al. (1978); Curtis et al. (1979); Dow Chemical Co. (1982); Dow Chemical Co. (1987); Furay and Smith (1995); Geiger et al. (1986); Heitmuller et al. (1981); Mayer and Ellersieck (1986); Mayes et al. (1983), Sijm et al. (1993);Smith et al. (1991); Tanneberger et al. (2010); Veith et al. (1983); Versonnen et al. (2003); Weil et al. (2009)
		Non-Fish Vertebrates (i.e., amphibians, reptiles, mammals)	-		-		

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate p-Dichlorobenzene (CASRN 106-46-7)		Isomers of *p*-Dichlorobenzene (CASRN 106-46-7) o-Dichlorobenzene (CASRN 95501) m-Dichlorobenzene (CASRN 541731) Dichlorobenzene (CASRN 25321226)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
	Chronic exposure	Vegetation	2	X	4	X	Ukeles (1962); Zhang et al. (2016); Zhang et al. (2017)
		Invertebrate	7	X	8	X	Calamari et al. (1983); Call et al. (1980); Davis and Hidu (1969); Deneer et al. (1988); Kuhn et al. (1989); Mortimer and Connell (1994); Mortimer and Connell (1995); Olmstead and LeBlanc (2005); Radix et al. (1999); Tong et al. (2010); Van der Zandt et al. (1994); Zhang et al. (2012)
		Fish	13	X	10	X	Ahmad et al. (1984); Barrows et al. (1980); Black et al. (1982); Calamari et al. (1982); Call et al. (1979b); Call et al. (1983); Carlson and Kosian (1987); Dow Chemical Co. (1982); Ganesan et al. (2013); Mayes et al. (1988); Oliver and Niimi (1985); Qian et al. (2004); Smith et al. (1990); Smith et al. (1991); Syracuse Research Corp. (1978); Van Leeuwen et al. (1990); Versonnen et al. (2003)
		Non-Fish Vertebrates (i.e., amphibians, reptiles, mammals)	-		1	X	Black et al. (1982)

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate p-Dichlorobenzene (CASRN 106-46-7)		Isomers of*p*-Dichlorobenzene (CASRN 106-46-7) o-Dichlorobenzene (CASRN 95501) m-Dichlorobenzene (CASRN 541731) Dichlorobenzene (CASRN 25321226)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
Terrestrial	Acute exposure	Vegetation	-		-		
		Invertebrate	1	X	2	X	Boyd et al. (2016); Neuhauser et al. (1985)
		Vertebrates	9	X	18	X	Ariyoshi et al. (1975); Den Besten et al. (1991); Gunawardhana et al. (1993); Herr and Boyes (1997); Hoglen et al. (1998); Kato and Kimura (1997); Kato et al. (1988); Kimura et al. (1985); Kitchin et al. (1993); Mally and Chipman (2002); Miyagawa et al. (1995); Mizutani et al. (1994); Mohtashamipur et al. (1987); Poland et al. (1971); Stine et al. (1991); Umemura et al. (1996); Valentovic et al. (1993); Yang et al. (1979); Younis et al. (2000)
	Chronic exposure	Vegetation	1	X	4	X	Bruns and Dawson (1959); Hulzebos et al. (1993); Meharg et al. (1998); Pfleeger et al. (1991)
		Invertebrate	2	X	-		Van Gestel et al. (1991)
		Vertebrates	8	X	4	X	Den Besten et al. (1991); Gustafson et al. (1998); Kulkarni et al. (1997); Mally and Chipman (2002); Shelby et al. (1993); Umemura et al. (1996); Umemura et al. (1998); Warnasuriya et al. (2010); Witt et al. (2000)

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 for *p*-dichlorobenzene.

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 *p*-dichlorobenzene's 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 data and human and ecological biomonitoring data. to inform *p*-dichlorobenzene's exposure potential (Table 13).

Results and Discussion

Release potential for environmental and human health exposure

Aggregated quantities of *p*-dichlorobenzene released on-site to air, water, and land, and aggregated quantities of *p*-dichlorobenzene 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 *p*-dichlorobenzene 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 *p*-Dichlorobenzene from Reporting Years 2011, 2015, and 2017 Used in this Document to Assess Exposure Potential

Year	Number of Facilities That Reported	Total Quantities Released On-Site to Air (lbs.)	Total Quantities Released On-Site to Water (lbs.)	Total Quantities Released (Disposed of) On-Site to Land (lbs.)	Total Quantities Transferred to POTW (lbs.)	Total Quantities Transferred to Other (Non-POTW) Wastewater Treatment Facilities (lbs.)
2011	15	53,358	5	4,214	0	0
2015	21	27,157	5	22,974	0	0
2017	18	30,506	5	24,519	0	0

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

For RY 2017, 18 facilities submitted TRI reports for *p*-dichlorobenzene. The total quantities of *p*-dichlorobenzene these facilities released on-site to air (as fugitive and stack emissions), surface water and land are: 30,506 pounds; five pounds; and 24,519 pounds, respectively. These facilities reported zero pounds of the chemical transferred to POTW and zero 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.

p-Dichlorobenzene has a vapor pressure range of 0.4 to 1.74 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 a reactant, as a chemical intermediate or incorporated into formulations, mixtures, or reaction products, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the volume is incorporated without significant process losses during its use as a reactant, intermediate or its incorporation into a formulation, mixture, or product. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

Worker/Occupational exposure
Worker exposures to this chemical may be affected by many factors, including but not limited to volume produced, processed and 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.

p-Dichlorobenzene has an Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) (OSHA, 2009). The PEL is 75 parts per million (ppm) or 450 milligrams (mg)/cubic meter (m^3) over an 8-hour work day, time weighted average (TWA). This chemical do not have a National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (NIOSH, 2005). The American Conference of Governmental Industrial Hygienists (ACGIH) set the Threshold Limit Value (TLV) at 10 ppm TWA.

p-Dichlorobenzene has a vapor pressure range of 0.4 to 1.74 mm Hg at 25 ºC. *p*-Dichlorobenzene'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.

Some handling activities of p-dichlorobenzene may generate dust, particularly when handled as a dry powder. Workers may be exposed to aerosolized particles.

Consumer exposure
CDR reporting and information from the National Institutes of Health (NIH) Consumer Product Database (CPD) and the Chemical and Products Database (CPDat) indicate that *p*-dichlorobenzene is widely used in consumer products, such as toilet fresheners, toilet blocks and mothballs, and the primary exposure occurs from breathing vapors within the home (Table 12) (ATSDR 2006, ECHA 2004).

Table 12. Exposure Information for Consumers

Chemical Identity	Consumer Product Database
	Consumer Uses (List)
p-Dichlorobenzene (106-46-7)	Adhesive, air freshener, air treatment, bathroom cleaner, cleaner, colorant, decor, fluid property modulator, fragrance, propellant, solvent, stabilizer, textile

Reference: CPDat

Indoor air concentration levels of *p*-dichlorobenzene within a restroom have been measured at 0.291 to 272 ppb, which are much higher values than outdoor levels (0.01 to 1 ppb) (ATSDR, 2006). The CPD has identified several products containing *p*-dichlorobenzene for air freshener and bathroom cleaner purposes. Several case reports discussed oral ingestion of *p*-dichlorobenzene due to its sweet taste or heavy use and exposure to crystals scattered in home to deter moths (ATSDR, 2006). Crystal products can be inhaled and are found within the lung parenchyma of individuals using this product, resulting in physical pathophysiology of fibrosis (ATSDR, 2006). Consumers using *p*-dichlorobenzene as a moth deterrent are often exposed to mixtures containing *p*-dichlorobenzene and naphthalene (ECHA, 2004).

General population exposure
The general population is exposed to *p*-dichlorobenzene by directly using public facilities that use products containing this chemical. *p*-Dichlorobenzene has been identified as the main dichlorobenzene present in drinking water, likely resulting from its release into surface waters after its extensive use in toilet deodorizers (IARC, 1999).

p-Dichlorobenzene has been found to have moderate release into the environment, to be moderately persistent, and to have a low bioaccumulation potential (U.S. EPA, 2014). *p*-Dichlorobenzene has been identified at 330 sites on the National Priorities List and in sediment, soil, drinking and groundwater, and air samples (U.S. EPA, 2014, ATSDR, 2006, Environment Canada, 2003). Most *p*-dichlorobenzene in the environment is released from consumer use of mothballs and toilet freshener, and it directly enters the environment both through air and water release (U.S. EPA, 2014, ATSDR, 2006). ECHA assessed environmental exposure and concluded that there was no reason to add measures to reduce risk of human exposure to *p*-dichlorobenzene via the environment beyond those already in place (ECHA, 2004)**.** Table 13 summarizes the information that EPA identified related to *p*-dichlorobenzene's environmental concentration data in air, water, and soil/sediment as well as human blood and aquatic, non-mammalian ecological biomonitoring data.

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	Yes	no	no	CARB (2005)
Comparative Toxicogenomics Database	Yes	yes	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	Yes	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	Yes	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	Yes	yes	no	CDC (2013)
USGS Monitoring Data –National Water Quality Monitoring Council	Yes	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)

Database Name	Env. Concen. Data Present?	Human Biomon. Data Present?	Ecological Biomon. Data Present?	Reference
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

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 *p*-dichlorobenzene may present an unreasonable risk of injury to health and/or the environment, including potentially exposed or susceptible subpopulations, (e.g., workers, women of reproductive age, consumers and children). This is based on the potential hazard and potential exposure of *p*-dichlorobenzene 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 *p*-dichlorobenzene 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, consumers and the general population, including exposure to children. In addition, EPA identified potential environmental (e.g., aquatic toxicity and terrestrial toxicity) and human health hazards (e.g., acute toxicity, repeated dose toxicity, developmental toxicity, irritation/corrosion, carcinogenicity, neurotoxicity, and observations in epidemiological studies or biomonitoring studies).

11. References

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

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