United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Proposed Designation of 1,3-Butadiene (CASRN 106-99-0) as a High-Priority Substance for Risk Evaluation

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Acronyms and Abbreviations

Term	Description
ATSDR	Agency for Toxic Substances and Disease Registry
ACGIH	American Conference of Governmental Industrial Hygienists
B	Billion
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
EPCRA	Emergency Planning and Community Right-to-Know Act
IUR	Inventory Update Rule
K_{OC}	Organic carbon-water partitioning coefficient
K_{OW}	Octanol-water partition coefficient
MITI	Ministry of International Trade and Industry, Japan
MP	Melting point
NIOSH	National Institute for Occupational Safety and Health
NKRA	Not Known or Reasonably Ascertainable
OECD	Organization for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
POTW	Publicly owned treatment works
SDWA	Safe Drinking Water Act
SIDS	Screening Information Data Sets
SMILES	Simplified molecular-input line-entry system
STEL	Short-term exposure limit

Term	Description
TBD	To be determined
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 (EPA) 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)). EPA uses scientific information that is consistent with the best available science. 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).

1,3-butadiene 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 1,3-butadiene 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 information on 1,3-butadiene, including relevant information received from the public and other information as appropriate.

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[1] 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

EPA will take comment on this proposed designation for 90 days before finalizing its designation of 1,3-butadiene. The docket number for providing comments on 1,3-butadiene is EPA-HQ-OPPT-2018-0451 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 1,3-butadiene reported under the Inventory Update Reporting (IUR) rule and Chemical Data Reporting (CDR) rule. 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
1,3-Butadiene (106-99-0)	>1B	>1B	>1B	>1B	>1B	>1B	4,321,004,265	1B to 5B	1B to 5B	1B to 5B	1B to 5B

B = billion

Reference: U.S. EPA (2013) and U.S. EPA (2017)

Results and Discussion

Production volume of 1,3-butadiene in 2015, as reported to EPA during the 2016 CDR reporting period, was between 1 and 5 billion pounds. The exact aggregate production volume is available for one year, 2011, in which 4.3 billion pounds of 1,3-butadiene was domestically manufactured or imported. Production volume of 1,3-butadiene as reported to EPA has remained stable from 1986-2016 (Table 1).

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 1,3-butadiene 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 lbs per site, except if certain TSCA actions apply (in which case the reporting requirement is greater than 2,500 lbs 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[3] 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).

[3] 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. 1,3-Butadiene (106-99-0) Categories and Subcategories of Conditions of Use[4] (2016 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
Manufacturing	Importing	Importing	U.S. EPA (2019a)
Processing	Processing as a reactant	Intermediate in: – Adhesive manufacturing – All other basic organic chemical manufacturing – Organic fiber manufacturing – Petrochemical manufacturing – Petroleum refineries – Plastic material and resin manufacturing – Synthetic rubber manufacturing – Wholesale and retail trade	U.S. EPA (2019a)
Processing	Processing as a reactant	Other in: – Plastic material and resin manufacturing – Synthetic rubber manufacturing	U.S. EPA (2019a)
Processing	Processing as a reactant	Plasticizers in: – Plastic material and resin manufacturing	U.S. EPA (2019a)
Processing	Processing as a reactant	Solvents (which become part of product formulation or mixture) in: – Synthetic rubber manufacturing	U.S. EPA (2019a)
Processing	Processing –incorporation into article	Other in: – Rubber product manufacturing	U.S. EPA (2019a)
Processing	Processing –incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed in: – Petrochemical manufacturing	U.S. EPA (2019a)
Processing	Processing –incorporation into formulation, mixture, or reaction product	Other in: – Petrochemical manufacturing	U.S. EPA (2019a)
Processing	Recycling	Recycling	U.S. EPA (2019a)
Distribution in commerce [a,b]	Distribution in commerce	Distribution in commerce	

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

Life-Cycle Stage	Category	Subcategory	Reference
Commercial Uses	Fuels and related products	Fuels and related products	U.S. EPA (2019a)
Commercial Uses	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
Commercial Uses	Automotive care products	Automotive care products	U.S. EPA (2019a)
Commercial Uses	Other (specify) in: Monomer used in polymerization process Sold to re-sellers for petroleum fuel and petrochemical industry Rubber tires	Other in: – Monomer used in polymerization process – Sold to re-sellers for petroleum fuel and petrochemical industry – Rubber tires	U.S. EPA (2019a)
Consumer Uses	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
Consumer Uses	Rubber Tires	Rubber tires	U.S. EPA (2019a)
Consumer Uses	Automotive care products	Automotive care products	U.S. EPA (2019a)
Disposal [a]	Disposal	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.

Table 3. 1,3-Butadiene (106-99-0) Categories and Subcategories of Conditions of Use[5] (2012 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
Manufacturing	Importing	Importing	U.S. EPA (2019a)
Processing	Processing as a reactant	Intermediate in: – Adhesive manufacturing – All other basic organic chemical manufacturing – Petrochemical manufacturing – Petroleum refineries – Plastic material and resin manufacturing – Synthetic rubber manufacturing – Wholesale and retail trade	U.S. EPA (2019a)
Processing	Processing as a reactant	Other in: – Plastics material and resin manufacturing – Synthetic rubber manufacturing	U.S. EPA (2019a)
Processing	Processing as a reactant	Fuels and fuel additives in: – Petroleum refineries	U.S. EPA (2019a)
Processing	Processing—incorporation into formulation, mixture, or reaction product	Intermediate in: – Petrochemical manufacturing	U.S. EPA (2019a)
Processing	Processing—incorporation into formulation, mixture, or reaction product	Other in: – Petrochemical manufacturing	U.S. EPA (2019a)
Processing	Processing—incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed in: – Petrochemical manufacturing	U.S. EPA (2019a)
Processing	Processing – repackaging	Intermediate in: – Wholesale and retail trade	U.S. EPA (2019a)
Processing	Recycling	Recycling	U.S. EPA (2019a)
Distribution in commerce [a,b]	Distribution in commerce	Distribution in Commerce	

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

Life-Cycle Stage	Category	Subcategory	Reference
Commercial Uses	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
Commercial Uses	Other (specify) in: Petrochemicals Petrochemical Applications Plastic Resins	Other in: – Petrochemicals – Petrochemical applications – Plastic resins	U.S. EPA (2019a)
Consumer Uses	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
Disposal [a]	Disposal	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 1,3-Butadiene, Reporting Year 2011

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Electric power generation, transmission, and distribution	2211
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Scientific research and development services	5417
	Import	Petroleum and coal products manufacturing	3241

Activity Type	Activity	Industry Group	NAICS Code
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
	Produce or import for on-site use/processing	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Aerospace product and parts manufacturing	3364
		Other pipeline transportation	4869
	Produce or import for sale/ distribution	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
	Produce or import as a byproduct	Electric power generation, transmission, and distribution	2211
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869

Activity Type	Activity	Industry Group	NAICS Code
		Scientific research and development services	5417
	Produce or import as an impurity	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
Process	Process as a reactant	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Other pipeline transportation	4869
	Process as an article component	Textile furnishings mills	3141
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Petroleum and petroleum products merchant wholesalers	4247
	Process as an impurity	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
	Process as a formulation component	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
	Process – repackaging	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Petroleum and coal products manufacturing	3241

Activity Type	Activity	Industry Group	NAICS Code
Otherwise Use	Otherwise use – as a chemical processing aid	Basic chemical manufacturing	3251
	Otherwise use – as a manufacturing aid	Other chemical product and preparation manufacturing	3259
	Otherwise use – ancillary or other use	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Scientific research and development services	5417
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Electric power generation, transmission, and distribution	2211
		Textile furnishings mills	3141
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Scientific research and development services	5417

Activity Type	Activity	Industry Group	NAICS Code
		Waste treatment and disposal	5622
	Energy recovery	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Rubber product manufacturing	3262
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Waste treatment and disposal	5622
	Recycling	Textile furnishings mills	3141
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Aerospace product and parts manufacturing	3364
	Treatment	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Waste treatment and disposal	5622

Reference: U.S. EPA, 2019b

Table 5. Activities and Uses Reported to TRI for 1,3-Butadiene, Reporting Year 2015

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Oil and gas extraction	2111
		Electric power generation, transmission, and distribution	2211
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Scientific research and development services	5417
	Import	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
	Produce or import for on-site use/ processing	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Aerospace product and parts manufacturing	3364
	Produce or import for	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251

Activity Type	Activity	Industry Group	NAICS Code
	sale/ distribution	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Petroleum and petroleum products merchant wholesalers	4247
	Produce or import as a byproduct	Electric power generation, transmission, and distribution	2211
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Scientific research and development services	5417
	Produce or import as an impurity	Oil and gas extraction	2111
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other pipeline transportation	4869
Process	Process as a reactant	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Other pipeline transportation	4869
	Process as an article component	Petroleum and coal products manufacturing	3241
		Gasoline stations	4471
		Waste treatment and disposal	5622

Activity Type	Activity	Industry Group	NAICS Code
	Process as an impurity	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other pipeline transportation	4869
	Process as a formulation component	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Other chemical product and preparation manufacturing	3259
		Petroleum and petroleum products merchant wholesalers	4247
	Process – repackaging	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Waste treatment and disposal	5622
Otherwise Use	Otherwise use – as a chemical processing aid	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
	Otherwise use – ancillary or other use	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Petroleum and petroleum products merchant wholesalers	4247
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Oil and gas extraction	2111
		Electric power generation, transmission, and distribution	2211

Activity Type	Activity	Industry Group	NAICS Code
		Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Gasoline stations	4471
		Other pipeline transportation	4869
		Scientific research and development services	5417
		Waste treatment and disposal	5622
	Energy recovery	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
	Recycling	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Petroleum and petroleum products merchant wholesalers	4247
		Gasoline stations	4471
	Treatment	Petroleum and coal products manufacturing	3241
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Iron and steel mills and ferroalloy manufacturing	3311
		Aerospace product and parts manufacturing	3364
		Ship and boat building	3366
		Chemical and allied products merchant wholesalers	4246
		Petroleum and petroleum products merchant wholesalers	4247
		Other pipeline transportation	4869
		Waste treatment and disposal	5622

Reference: U.S. EPA, 2019b

Table 6. Activities and Uses Reported to TRI for 1,3-Butadiene, Reporting Year 2017

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Electric Power Generation, Transmission, and Distribution	2211
		Petroleum and Coal Products Manufacturing	3241
		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 Chemical Product and Preparation Manufacturing	3259
		Iron and Steel Mills and Ferroalloy Manufacturing	3311
		Aerospace Product and Parts Manufacturing	3364
		Chemical and Allied Products Merchant Wholesalers	4246
		Petroleum and Petroleum Products Merchant Wholesalers	4247
		Other Pipeline Transportation	4869
		Scientific Research and Development Services	5417
	Import	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Pipeline Transportation	4869
	Produce or import for on-site use/ processing	Petroleum and Coal Products Manufacturing	3241
		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 Chemical Product and Preparation Manufacturing	3259
		Aerospace Product and Parts Manufacturing	3364
	Produce or import for sale/distribution	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Produce or import as a byproduct	Electric Power Generation, Transmission, and Distribution	2211
		Petroleum and Coal Products Manufacturing	3241
		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 Chemical Product and Preparation Manufacturing	3259
		Iron and Steel Mills and Ferroalloy Manufacturing	3311
		Aerospace Product and Parts Manufacturing	3364
		Chemical and Allied Products Merchant Wholesalers	4246
		Petroleum and Petroleum Products Merchant Wholesalers	4247
		Other Pipeline Transportation	4869
		Scientific Research and Development Services	5417
		Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251

Activity Type	Activity	Industry Group	NAICS Code
	Produce or import as an impurity	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Other Pipeline Transportation	4869
Process	Process as a reactant	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Other Chemical Product and Preparation Manufacturing	3259
		Other Pipeline Transportation	4869
	Process as an article component	Petroleum and Coal Products Manufacturing	3241
		Other Chemical Product and Preparation Manufacturing	3259
		Petroleum and Petroleum Products Merchant Wholesalers	4247
	Process as an impurity	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Other Pipeline Transportation	4869
	Process as a formulation component	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
	Process – repackaging	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Chemical and Allied Products Merchant Wholesalers	4246
		Petroleum and Petroleum Products Merchant Wholesalers	4247
		Other Pipeline Transportation	4869
Otherwise Use	Otherwise use – as a chemical processing aid	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251

Activity Type	Activity	Industry Group	NAICS Code
	Otherwise use – ancillary or other use	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Other Chemical Product and Preparation Manufacturing	3259
		Aerospace Product and Parts Manufacturing	3364
		Ship and Boat Building	3366
		Waste Treatment and Disposal	5622
Waste Management	Disposal/ releases	Electric Power Generation, Transmission, and Distribution	2211
		Petroleum and Coal Products Manufacturing	3241
		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 Chemical Product and Preparation Manufacturing	3259
		Iron and Steel Mills and Ferroalloy Manufacturing	3311
		Aerospace Product and Parts Manufacturing	3364
		Ship and Boat Building	3366
		Chemical and Allied Products Merchant Wholesalers	4246
		Petroleum and Petroleum Products Merchant Wholesalers	4247
		Other Pipeline Transportation	4869
		Scientific Research and Development Services	5417
		Waste Treatment and Disposal	5622
	Energy recovery	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Aerospace Product and Parts Manufacturing	3364
	Recycling	Petroleum and Coal Products Manufacturing	3241

Activity Type	Activity	Industry Group	NAICS Code
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Petroleum and Petroleum Products Merchant Wholesalers	4247
	Treatment	Petroleum and Coal Products Manufacturing	3241
		Basic Chemical Manufacturing	3251
		Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	3252
		Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	3253
		Aerospace Product and Parts Manufacturing	3364
		Ship and Boat Building	3366
		Chemical and Allied Products Merchant Wholesalers	4246
		Petroleum and Petroleum Products Merchant Wholesalers	4247
		Other Pipeline Transportation	4869
		Waste Treatment and Disposal	5622

Reference: U.S. EPA, 2019b

CDR and TRI Summary and Additional Information on Conditions of Use

According to reports to the 2016 CDR, 1,3-butadiene was manufactured domestically and imported into the United States. It has been associated more with industrial processing and use than commercial and consumer use. It was processed most commonly as a reactant, and was also processed through incorporation into a formulation, mixture, or reaction product and through incorporation into articles. The chemical substance was reported as recycled. The most commonly identified industrial functional category was as an intermediate; common industrial use sectors included: petrochemical manufacturing, synthetic rubber manufacturing, plastic material and resin manufacturing, and petroleum refineries. Commercial product categories consisted of plastic and rubber products, rubber tires, fuels and related products, sold to re-sellers for petroleum fuel and petrochemical industry, automotive products, and monomer used in polymerization process. A small number of consumer uses were identified, which consisted of automotive care products, rubber tires, and plastic and rubber products. Consumer uses were also identified in additional databases, which are included in the Exposure Potential section (Section 8).

The information reported to the 2016 CDR for manufacture, industrial processing and use, and commercial and consumer use information is similar to that reported to the 2012 CDR. Companies generally submitted greater details to the 2016 CDR than to the 2012 CDR regarding processing and use information. In addition, the following commercial uses were reported to the 2016 CDR but not reported to the 2012 CDR: monomer used in the polymerization process, rubber tires, automotive care products, and sold to re-sellers for petroleum fuel and the petrochemical industry. The 2012 CDR contained repackaging as a processing type that was not identified in the 2016 CDR. Overall, CDR information shows that processing and use did not change significantly between the 2012 and 2016 CDR periods.

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 Years (RY) 2011, 2015, and 2017. RY 2011, 2015, and 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, Table 5, and Table 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 1,3-butadiene.

According to public comments, there are many uses of 1,3-butadiene and it has widespread function as a monomer for several types of polymer (EPA-HQ-OPPT-2018-0451-0004). The handling and use of 1,3-butadiene in the production of synthetic rubber occurs under carefully controlled conditions with negligible potential for occupational exposure or environmental release. Because the synthetic rubbers are stable and do not degrade back to the 1,3-butadiene monomer, the potential for exposure to 1,3-butadiene during processing of the elastomers and consumer use of articles produced from synthetic rubber is negligible. Synthetic rubber is manufactured for tires, auto parts, the medical industry, adhesives and sealants, footwear, industrial goods, the construction industry, appliances, lubricants, fabrics, and wires and cables (EPA-HQ-OPPT-2018-0451-0003). Manufacturers have identified residual amounts of the chemical in aerosol propellants, architectural paints and coatings, and also in resins; and

formulators are uncertain how much remains in the end product from the residuals in raw materials (EPA-HQ-OPPT-2018-0451-0005). The aerospace industry uses 1,3-butadiene as a constituent within products or formulations used in the manufacture, operation, and maintenance of aerospace products. This substance can be used as a constituent in adhesives and resins for pre-impregnated fiberglass or carbon reinforced fabrics and tapes, and as a constituent in space vehicle propellants. Specific aerospace industrial uses include, but may not be limited to, adhesives critical to electrical and circuit boards for its thermal properties and low outgassing properties. It is also a component of pre-impregnated fiberglass or carbon reinforced fabrics and tapes, and epoxy resin adhesive systems for bonding and sealing of glass to metal components (EPA-HQ-OPPT-2018-0451-0009).

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, EPA identified children, women of reproductive age, consumers and workers as subpopulations who may be potentially exposed or susceptible subpopulations for 1,3-butadiene.

Children

EPA used data reported to the 2012 and 2016 CDR to identify uses in products and articles intended for children over time for 1,3-butadiene. Table 7 summarizes the non-CBI CDR information regarding commercial and consumer use and notes whether the chemical substance was identified as being used in products intended for children. EPA also identified potential developmental hazards that would impact any stage of children's development.

Table 7. Uses in Children's Products Information[6]

Chemical	Year	Product Category (Product concentration, number of workers)	Consumer or Commercial	Used in Products Intended for Children
1,3-Butadiene (106-99-0)	2012	Plastic and rubber products not covered elsewhere	Both	NKRA
		Petrochemicals	Commercial	No
		Petrochemical applications	Commercial	No
		Plastic resins	Commercial	No
	2016	Fuels and related products	Commercial	No
		Plastic and rubber products not covered elsewhere	Commercial	Yes
		Automotive care products	Commercial	No
		Monomer used in polymerization process	Commercial	No
		Rubber tires	Commercial	No
		Sold to re-sellers for petroleum fuel and petrochemical industry	Commercial	No
		Plastic and rubber products not covered elsewhere	Consumer	Yes
		Rubber tires	Consumer	No
		Automotive care products	Consumer	No

Notes: NKRA = not known or reasonably ascertainable
Reference: U.S. EPA (2019a)

Women of reproductive age (e.g., pregnant women per TSCA statute)
EPA identified studies that observed developmental and reproductive effects following exposure to 1,3-butadiene (Section 7, Table 10). Thus, women of reproductive age were identified as a potentially exposed or susceptible subpopulation.

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.

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

5. Persistence and bioaccumulation

Approach
EPA reviewed reasonably available information, such as physical and chemical properties and environmental fate characteristics to understand 1,3-butadiene's persistence and bioaccumulation.

Physical and Chemical Properties and Environmental Fate Tables
Tables 8 and 9 summarize the physical and chemical properties and environmental fate characteristics of 1,3-butadiene, respectively.

Results and Discussion
1,3-Butadiene is a moderately water-soluble (735 mg/L) gas with a vapor pressure of 2,107 mm Hg. Despite its moderate water solubility, 1,3-butadiene's measured Henry's Law constant (7.36×10^{-2} atm-m^3/mol) indicates that it is not likely to persist in surface water but rather volatilize upon release. Gaseous 1,3-butadiene absorbs light at wavelengths >290 nm and may be susceptible to direct photodegradation; however, the primary pathway for atmospheric degradation of 1,3-butadiene is likely to proceed through indirect photolysis via bimolecular reactions with photochemically-produced hydroxyl radicals, nitrate radicals, and ozone at rates corresponding to half-lives of 3.7 hours, 14.9 hours, and 33.6–40.8 hours, respectively. 1,3-Butadiene is not expected to hydrolyze due to a lack of hydrolyzable functional groups.

In aerobic aquatic environments, 1,3-butadiene was not observed to be readily biodegradable as it achieved only 0–4 percent degradation over a 28-day incubation period using a sludge inoculum and the OECD 301C, Ministry of International Trade and Industry (MITI) test method. Based on these results, this chemical may persist in subsurface environments, groundwater, or enclosed pipes when volatilization is not an option. Additionally, this chemical is expected to have low bioaccumulation potential based on an estimate of 10 for both bioconcentration factor and bioaccumulation factor and a measured log K_{OW} of 1.99.

Table 8. Physical and Chemical Properties of 1,3-Butadiene

Property or Endpoint	Value[a]	Reference
Molecular Formula	C_4H_6	Rumble (2018)
Molecular Weight	54.091 g/mole	Rumble (2018)
Physical State	Gas	Rumble (2018)
Physical Form	Colorless gas (shipped as a compressed gas/liquified; liquid at <−4.4 °C)	HSDB (2015) citing NIOSH (2010)
Purity	Impurities includes acetylene	HSDB (2015) citing IARC (1986)
Melting Point	−108.9 °C	U.S. EPA (2012); ATSDR (2012)
Boiling Point	−4.4 °C	U.S. EPA (2012)
Density	0.6194 g/mL at 25 °C	Sun and Wristers (2002); Lide (2008)
Vapor Pressure	2107 mm Hg at 25 °C	Daubert and Danner (1985); ATSDR (2012)
Vapor Density	1.88 (relative vapor density to air = 1)	ATSDR (2012) citing NIOSH (2005); ECB (2002)
Water Solubility	735 mg/L at 25 °C	McAuliffe (1966); ATSDR (2012)
Log K_{OW}	1.99	Daubert and Danner (1985); U.S. EPA (2012); ATSDR (2012) citing Hansch et al. (1995)
Henry's Law Constant	7.36×10^{-2} atm-m^3/mol at 25 °C (calculated from vapor pressure and water solubility)	U.S. EPA (2012); ATSDR (2012)
Flash Point	−85 (Abel Pensky closed cup) °C	Sun and Wristers (2002); ECB (2002)
	−76 °C (closed cup)	ATSDR (2012) citing Lewis (2007); ECB (2002)
Auto Flammability	417.8 °C	Sun and Wristers (2002)
	415 °C	ECB (2002)
	414 °C	ATSDR (2012) citing Lewis (2007)
Viscosity	0.33 mPa·s at −40 °C; 0.25 mPa·s at 0 °C; 0.20 mPa·s at 40 °C	Sun and Wristers (2002)
Refractive Index	1.43 at 25 °C; 1.42 at 1.3 °C	Sun and Wristers (2002); HSDB (2015)
Dielectric Constant	TBD	TBD

Property or Endpoint	Value[a]	Reference
Surface Tension	13.4 dynes/cm at 20 °C	HSDB (2015) citing U.S. Coast Guard (1978)

[a]Measured unless otherwise noted
TBD = to be determined, if reasonably available. **EPA is particularly interested in information from the public on these properties or endpoints.**

Table 9. Environmental Fate Characteristics of 1,3-Butadiene

Property or Endpoint	Value[a]	Reference
Direct Photodegradation	Absorbs at wavelengths >290 nm, and therefore, may be susceptible to direct photolysis by sunlight	HSDB (2015)
	The primary pathway of destruction of 1,3-butadiene is likely to occur by photo-initiated bimolecular processes rather than direct photochemical degradation	ATSDR (2012); Kopczynski et al. (1972)
Indirect Photodegradation	$t_{1/2}$ = 3.7 hours (based on a 12-hour day with 1.5×10^6 OH/cm^3 and hydroxyl radical reaction rate constant of 6.93×10^{-11} cm^3/molecule-sec at 25 °C)	HSDB (2015)
	$t_{1/2}$ = 5.6 hours (based on a 12-hour day with 5×10^5 molecules OH /cm^3 and hydroxyl radical reaction rate constant of 6.93×10^{-11} cm^3/molecule-sec at 25 °C) Major products formed from the reaction include acrolein and formaldehyde	ATSDR (2012) citing Atkinson (1989) and Baker et al. (2005)
	$t_{1/2}$ = 1.4–1.7 days (based on a 12-hour day with 7×10^{11} molecules ozone/cm^3 and an ozone reaction rate constant of 6.7×10^{-18} cm^3/molecule-sec at 25 °C) Major products formed from the reaction of 1,3-butadiene with ozone are acrolein, formaldehyde, acetylene, ethylene, and formic anhydride	HSDB (2015); ATSDR (2012) citing Atkinson and Carter (1984b)
	$t_{1/2}$ = 14.9 hours (based on a 12-hour day with 2.4×10^8 nitrate molecules/cm^3 and a nitrate radical reaction rate constant of 5.4×10^{-14} cm^3/molecule-sec at 22 °C) Acrolein was identified as the major product of this reaction	HSDB (2015); ATSDR (2012) citing Atkinson et al. (1984a)
Hydrolysis	Not expected to hydrolyze due to lack of hydrolysable functional groups	ECB (2002)
	Metabolic byproducts of 1,3-butadiene can be hydrolyzed rapidly	ATSDR (2012) citing Kirman (2010)

Property or Endpoint	Value[a]	Reference
Biodegradation	0–4%/28 days (based on OECD 301C study with 1-drop of sludge/L)	NITE (2019)
	Biodegradation of 1,3-butadiene in water and soil proceeds through oxidation to form 3,4-epoxy-1-butene, a potent electrophile (with pure cultures)	ATSDR (2012) citing Hou et al. (1979); Patel et al. (1982), and Watkinson and Somerville (1976)
Wastewater Treatment	97% total removal (0.02% by biodegradation, 0.53% by sludge, 96% by volatilization to air; estimated)[b]	U.S. EPA (2012)
Bioconcentration Factor	10 (estimated)[b]	U.S. EPA (2012)
Bioaccumulation Factor	10 (estimated)[b]	U.S. EPA (2012)
Soil Organic Carbon:Water Partition Coefficient (Log K_{OC})	2.46	ATSDR (2012) citing Hansch et al. (1995) and Lyman et al. (1990)
[a]Measured unless otherwise noted [b]EPI Suite™ physical property inputs: Log K_{OW} = 1.99, BP = -4.40 °C, MP = -108.90 °C, VP = 2110 mm Hg, WS = 735 mg/L SMILES C(C=C)=C		

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

1,3-Butadiene is subject to TRI reporting under EPCRA (U.S. EPA 2011). It has been designated a CERCLA hazardous substance and releases in quantities equal to or greater than 10 pounds are subject to reporting to the National Response Center under CERCLA. 1,3-Butadiene also has a threshold quantity of 10,000 pounds on the CAA's list of Regulated Chemicals for Accidental Release Prevention (U.S. EPA 2015).

EPA has not established Maximum Contaminant Levels or Goals for 1,3-butadiene; however, it was identified on both the Third (U.S. EPA 2009) and Fourth (U.S. EPA 2016) Contaminant Candidate Lists (CCL) under SDWA. It is not considered a priority pollutant under CWA.

7. Hazard potential

Approach

EPA considered reasonably available information from peer-reviewed assessments and databases to identify potential human health and environmental hazards for 1,3-butadiene.

Because there are very few publicly available assessments for dibutyl phthalate with cited environmental hazard data, EPA uses 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)[7]. 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 1,3-butadiene, if available, to fill in potential data gaps when there were no reported observed effects for specific taxa exposed to 1,3-butadiene.

Potential Human Health and Environmental Hazard Tables

EPA did not identify environmental hazard information for 1,3-butadiene. However, EPA identified potential human health hazards and those are summarized in Table 10. EPA is particularly interested in information from the public on environmental hazards.

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

Table 10. Potential Human Health Hazards Identified for 1,3-Butadiene

Human Health Hazards	Tested for Specific Effect	Effect Observed	Data Source
Acute Toxicity	X	X	NICNAS (2013), OEHHA (2013), ATSDR (2012), U.S. EPA (2008), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999)
Repeated Dose Toxicity	X	X	NICNAS (2013), NTP (2016), OEHHA (2013), ATSDR (2012), IARC (2012), U.S. EPA (2008), Cal EPA (2007), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993)
Genetic Toxicity	X	X	NICNAS (2013), NTP (2016), OEHHA (2013), ATSDR (2012), IARC (2012), U.S. EPA (2008), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993), RIVM (2009)
Reproductive Toxicity	X	X	NICNAS (2013), OEHHA (2013), ATSDR (2012), U.S. EPA (2008), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993), OEHHA (2004)
Developmental Toxicity	X	X	NICNAS (2013), OEHHA (2013), ATSDR (2012), U.S. EPA (2008), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993)
Toxicokinetic	X		NICNAS (2013), NTP (2016), OEHHA (2013), ATSDR (2012), IARC (2012), U.S. EPA (2008), ECB (2002), U.S. EPA (2002), Env Canada (2000), NTP (1999), NTP (1993)
Irritation/Corrosion	X	X	NICNAS (2013), OEHHA (2013), U.S. EPA (2008), ECB (2002), NTP (1999), NTP (1993)
Dermal Sensitization			ATSDR (2012), U.S. EPA (2008)
Respiratory Sensitization			ATSDR (2012), U.S. EPA (2008)
Carcinogenicity	X	X	NICNAS (2013), NTP (2016), OEHHA (2013), ATSDR (2012), IARC (2012), U.S. EPA (2008), Cal EPA (2007), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993), RIVM (2009)
Immunotoxicity	X	X	NICNAS (2013), ATSDR (2012), Env Canada (2000)
Neurotoxicity	X	X	OEHHA (2013), ATSDR (2012), U.S. EPA (2008), ECB (2002), NTP (1999), NTP (1993)
Epidemiological Studies or Biomonitoring Studies	X	X	NICNAS (2013), NTP (2016), OEHHA (2013), ATSDR (2012), IARC (2012), U.S. EPA (2008), Cal EPA (2007), U.S. EPA (2002), ECB (2002), Env Canada (2000), NTP (1999), NTP (1993)

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.

8. Exposure potential

Approach

EPA considered reasonably available information to identify potential environmental, worker/occupational, consumer and general population exposures to 1,3-butadiene.

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 1,3-butadiene'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 to inform 1,3-butadiene's exposure potential (Table 13).

Results and Discussion

Release potential for environmental and human health exposure

Aggregated quantities of 1,3-butadiene released on-site to air, water, and land, and aggregated quantities of 1,3-butadiene transferred off-site to POTWs 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 1,3-butadiene 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, 3-Butadiene 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	195	1,276,301	1,344	6,126	1	50,629
2015	200	1,824,555	160	18,140	3	123,443
2017	190	1,353,825	233	35,852	4	43,916

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

For RY 2017, 190 facilities submitted TRI reports for 1,3-butadiene. The total quantities of 1,3-butadiene these facilities released on-site to air (as fugitive and stack emissions), surface water and land are: 1,353,825 pounds; 233 pounds; and 35,852 pounds, respectively. These facilities reported four pounds of the chemical transferred to POTWs and 43,916 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 1,3-butadiene received by the non-POTW wastewater treatment facilities may have been released to surface waters or to air during treatment processes at the facilities.

1,3-Butadiene has a vapor pressure of 2,107 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, 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. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

When chemical substances are 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 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.

When chemical substances are repackaged, the industrial releases may be a relatively low percentage of the production volume. Lower percentage releases occur when a high percentage of the chemical is repackaged without significant process losses during its repackaging. The actual percentages, quantities, and media of releases of the reported chemical associated with this processing or use are not known.

When chemical substances have industrial use as chemical 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. The actual percentage and quantity of release of the reported chemical associated with this category are not known.

When chemical substances have industrial use as solvents in product formulations or mixtures, the industrial and/or end use releases may be a relatively high percentage of the production volume. Higher percentage releases occur when the chemical's intended use is as a solvent that may evaporate into the atmosphere or may be collected and disposed to aqueous media. In some cases, some engineering controls or capture for recycle or reclamation may reduce these losses. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

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.

1,3-Butadiene has an Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL)[8]. The PEL is 1 part per million (ppm) over an 8-hour work day, time-weighted average (TWA). The OSHA Short-Term Exposure Limit (STEL) for 1,3-Butadiene is 5 ppm (OSHA 2019). The American Conference of Governmental Industrial Hygienists (ACGIH) set the Threshold Limit Value (TLV) at 2 ppm TWA.

1,3-Butadiene is a gas at ambient room temperature conditions and there is the potential for inhalation exposure to the gas. The extent of inhalation exposure could vary from facility to facility depending on many factors including but not limited to engineering controls, type of facility, and process design.

Consumer exposure
Based on CDR reporting information, 1,3-butadiene appears to be used in several types of consumer products, specifically plastic and rubber products, rubber tires, and automotive care products. The National Institutes of Health Consumer Product Database and the Chemical and

[8] OSHA, 2009. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs). https://www.osha.gov/dsg/annotated-pels/tablez-1.html

Products Database (CPDat) report use of 1,3-butadiene in consumer products such as adhesives and paints and coatings (Table 12).

Table 12. Exposure Information for Consumers

Chemical Identity	Consumer Product Database
	Consumer Uses (List)
1,3-Butadiene (106-99-0)	Adhesive, anti-adhesive, anti-friction, anti-setoff, apparel, automotive, automotive care, automotive component, binding, building material, casting agent, cleaner, electronics, filler, filler building material, fluid property modulator, glass cleaner, hardener, insulation, lubricant, metal surface treatment, paint, paint binding, paper, paving, photographic, plastic polish, plastic, polish, printing, printing ink, propellant, rubber, surface treatment, textile

Reference: CPDat

In addition, according to recent available assessments, 1,3-butadiene is also listed as being used to manufacture several consumer products (NTP 1999, ATSDR 2012, NICNAS 2013, NTP 2016). The primary route of exposure to 1,3-butadiene is inhalation, and although some exposure may occur through ingestion of contaminated food, water, or dermal contact, these routes of exposure were considered unlikely in recent assessments (NTP 2016, ATSDR 2012). 1,3-Butadiene is not a common contaminant of water supplies (NTP 2016). Some cooking oils, such as rapeseed or canola, have been noted to release 1,3-butadiene when heated (NTP 2016).

General population exposure
EPA identified environmental concentration data to inform 1,3-butadiene's exposure potential (Table 13).

The primary route of general population exposure to 1,3-butadiene is reported as inhalation. 1,3-Butadiene is almost always present at very low concentrations in U.S. cities and large suburban areas (OEHHA 2013). Recent available assessments note the general population is exposed to low levels of 1,3-butadiene in the air due to its presence in gasoline, motor-vehicle exhausts as a product of incomplete combustion of gasoline and diesel oil, the thermal breakdown of plastics, and cigarette smoke (NTP 2016).

Releases of 1,3-butadiene from certain conditions of use, such as manufacturing, disposal, or hazardous waste treatment activities, may result in general population exposures (OEHHA 2013). Elevated concentrations of 1,3-butadiene have been measured in the vicinity of heavily trafficked areas, refineries, chemical manufacturing plants, and plastic and rubber factories (OEHHA 2013). Populations living in areas near oil refineries, chemical manufacturing plants, and plastic and rubber factories—where 1,3-butadiene is manufactured or used—would be expected to have higher exposures (ATSDR 2012). Smokers, those exposed to secondhand smoke, and individuals inhaling smoke from wood fires would also be exposed to higher levels of 1,3-butadiene (ATSDR 2012, IARC 2012).

1,3-Butadiene also is formed naturally as a by-product of forest fires (NTP 2016, IARC 2012). Low levels of 1,3-butadiene have been detected in U.S. drinking water supplies, food samples, and within plastic or rubber food containers. However, reports note a lack of data available to

quantify general population exposure to 1,3-butadiene by routes other than inhalation, although it is expected to be low in comparison to breathing contaminated air (NTP 2016, ATSDR 2012).

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)
Comparative Toxicogenomics Database	yes	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	no	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	no	no	no	U.S. EPA (2018b)
Information Platform for Chemical Monitoring Data	no	no	no	EC (2018)
International Council for the Exploration of the Sea	no	no	no	ICES (2018)
OECD Monitoring Database	no	no	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	no	no	no	USGS (1991d)
USGS Monitoring Data –National Water Quality Monitoring Council, Soil	no	no	no	USGS (1991e)
USGS Monitoring Data –National Water Quality Monitoring Council, Surface Water	no	no	no	USGS (1991f)
USGS Monitoring Data –National Water Quality Monitoring Council, Tissue	no	no	no	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 and is proposing to find that 1,3-butadiene may present an unreasonable risk of injury to health and/or the environment, including potentially exposed or susceptible subpopulations, (e.g., workers, consumers, women of reproductive age and children). This is based on the potential hazard and potential exposure of 1,3-butadiene 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 1,3-butadiene may result in presence of the chemical in surface water, ingestion of the chemical in drinking water, inhalation of the chemical from air releases, exposure to workers, exposure to consumers and exposure to the general population, including exposure to children. In addition, EPA identified potential human health hazards (e.g., acute toxicity, repeated dose toxicity, genetic toxicity, reproductive and developmental toxicity, irritation, carcinogenicity, immunotoxicity, neurotoxicity and observations in epidemiologic and/or biomonitoring studies).

11. References

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

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