United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Proposed Designation of Di-Ethylhexyl Phthalate (DEHP) (1,2-Benzene- dicarboxylic acid, 1,2-bis (2-ethylhexyl) ester) (CASRN 117-81-7) as a High-Priority Substance for Risk Evaluation

August 22, 2019

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Acronyms and Abbreviations

Term	Description
ACGIH	American Conference of Governmental Industrial Hygienists
BP	Boiling point
Biomon.	Biomonitoring
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
CPDat	Chemical and Products Database
CPSC	U.S. Consumer Product Safety Commission
CWA	Clean Water Act
DEHP	Di-ethylhexyl phthalate (1,2-Benzene- dicarboxylic acid, 1,2- bis(2-ethylhexyl) ester
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
IUR	Inventory Update Reporting
K_{OC}	Organic carbon-water partitioning coefficient
K_{OW}	Octanol-water partitioning coefficient
M	Million
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	Milligram per liter
mm Hg	Millimeter of mercury
MP	Melting point
N/A	Not applicable
NICNAS	National Industrial Chemicals Notification and Assessment Scheme

Term	Description
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NKRA	Not known or reasonably ascertainable
NPDES	National Pollutant Discharge Elimination System
NPDWR	National Primary Drinking Water Regulation
NR	Not reported
NTP	National Toxicology Program
OECD	Organisation for Economic Co-operation and Development
OH	Hydroxyl radical
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
POTW	Publicly owned treatment works
PPE	Personal protective equipment
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
SDWA	Safe Drinking Water Act
SMILES	Simplified molecular-input line-entry system
STEL	Short-term exposure limit
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TTO	Total toxic organics
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's) implementing regulations (40 CFR 702.3)[1], a high-priority substance for risk evaluation is defined as a chemical substance that EPA determines, without consideration of costs or other non-risk factors, may present an unreasonable risk of injury to health or the environment because of a potential hazard and a potential route of exposure under the conditions of use, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant by EPA.

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

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

This document presents the review of the candidate chemical substance against the criteria and considerations set forth in 40 CFR 702.9 for a may present 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).

Di-ethylhexyl phthalate (DEHP) is one of the 40 chemical substances initiated for prioritization as referenced in the March 21, 2019 notice (84 FR 1049)[2]. EPA has determined that DEHP 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 DEHP, including relevant information received from the public and other information as appropriate.

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

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

EPA will take comment on this proposed designation for 90 days before finalizing its designation of DEHP. The docket number for providing comments on DEHP is EPA-HQ-OPPT-2018-0433 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 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 DEHP reported under the Inventory Update Reporting (IUR) rule and Chemical Data Reporting (CDR) rule.[3]

Results and Discussion

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

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

Chemical ID	1986	1990	1994	1998	2002	2006	2011	2012	2013	2014	2015
Di-Ethylhexyl Phthalate (117-81-7)	100M to 250M	100M to 250M	100M to 250M	100M to 250M	100M to 250M	100M to 250M	152,694,720	100M to 250M	100M to 250M	100M to 250M	100M to 250M

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

Production volume of DEHP in 2015, as reported to EPA during the 2016 CDR reporting period, ranged between 100 million pounds and 250 million pounds (Table 1). Since 1986, the production volume of di-ethylhexyl phthalate, as reported to CDR, has consistently ranged between 100 million pounds and 250 million pounds per year (Table 1). In 2011, an exact production volume of 152,694,720 pounds of DEHP was reported to CDR.

[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 EPA 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 DEHP 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 indicated that the information is CBI.

Table 2. Di-Ethylhexyl Phthalate (CASRN 117-81-7) Categories and Subcategories of Conditions of Use[5] (2016 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory of Use	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	Incorporation into article	Plasticizers in: – All other basic organic chemical manufacturing – Food, beverage, and tobacco product manufacturing – Medical devices – Plastic material and resin manufacturing – Plastics product manufacturing	U.S. EPA (2019a)
	Incorporation into formulation, mixture, or reaction product	Incorporated into plasticizers: – Adhesive manufacturing – All other basic inorganic chemical manufacturing – All other basic organic chemical manufacturing – Custom compounding of purchased resins – Miscellaneous manufacturing – Paint and coating manufacturing – Plastics material and resin manufacturing – Plastics product manufacturing – Rubber product manufacturing – Services	U.S. EPA (2019a)
	As a reactant	Plasticizers: – Plastic material and resin manufacturing – Rubber product manufacturing – Synthetic rubber manufacturing	U.S. EPA (2019a)
	Repackaging	Other functional use in wholesale and retail trade	U.S. EPA (2019a)
	Repackaging	CBI[6] functional use in wholesale and retail trade	U.S. EPA (2019a)
	Recycling	Recycling	

[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 CBI by the information submitter; it does not reflect the result of an EPA substantiation review.

Life-Cycle Stage	Category	Subcategory of Use	Reference
Distribution in Commerce [a,b]	Distribution in commerce		
Industrial Uses	Plasticizer	In plastic material and resin manufacturing	U.S. EPA (2019a)
Commercial Uses	Building/construction materials not covered elsewhere	Building/construction materials not covered elsewhere	U.S. EPA (2019a)
	Electrical and electronic products	Electrical and electronic products	U.S. EPA (2019a)
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere	U.S. EPA (2019a)
	Food packaging	Food packaging	U.S. EPA (2019a)
	Furniture and furnishings not covered elsewhere	Furniture and furnishings not covered elsewhere	U.S. EPA (2019a)
	Non-TSCA	Non-TSCA	U.S. EPA (2019a)
	Paints and coatings	Paints and coatings	U.S. EPA (2019a)
	Personal care products	Personal care products	U.S. EPA (2019a)
	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	U.S. EPA (2019a)
Consumer Uses	Building/construction materials not covered elsewhere	Building/construction materials not covered elsewhere	U.S. EPA (2019a)
	Electrical and electronic products	Electrical and electronic products	U.S. EPA (2019a)
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere	U.S. EPA (2019a)
	Furniture and furnishings not covered elsewhere	Furniture and furnishings not covered elsewhere	U.S. EPA (2019a)
	Paints and coatings	Paints and coatings	U.S. EPA (2019a)
	Personal care products	Personal care products	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory of Use	Reference
	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	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.

Table 3. Di-Ethylhexyl Phthalate (CASRN 117-81-7) Categories and Subcategories of Conditions of Use[7] (2012 CDR Reporting Cycle)

Life-Cycle Stage	Category	Subcategory of Use	Reference
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2019a)
	Import	Import	U.S. EPA (2019a)
Processing	Incorporation into article	Incorporated into plasticizers: – All other basic organic chemical manufacturing – Custom compounding of purchased resins – Plastics product manufacturing – Medical Devices	U.S. EPA (2019a)
	Incorporation into formulation, mixture, or reaction product	Incorporated into plasticizers: – All other basic organic chemical manufacturing – All other chemical product and preparation manufacturing – Custom compounding of purchased resins – Miscellaneous manufacturing – Paint and coating manufacturing – Plastics material and resin manufacturing – Plastics product manufacturing	U.S. EPA (2019a)
	Intermediate	Plastics product manufacturing	U.S. EPA (2019a)
	Processing as a reactant	Adhesives and sealant chemicals in adhesive manufacturing	U.S. EPA (2019a)
	Recycling	Recycling	

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

Life-Cycle Stage	Category	Subcategory of Use	Reference
Distribution in Commerce[a,b]	Distribution in commerce		
Industrial Uses	Plasticizer	In plastic material and resin manufacturing	U.S. EPA (2019a)
	Other: Substance sold to distributors for sale to their customers	In wholesale and retail trade	U.S. EPA (2019a)
Commercial Uses	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019a)
	Arts, crafts, and hobby materials	Arts, crafts, and hobby materials	U.S. EPA (2019a)
	Building/construction materials not covered elsewhere	Building/construction materials not covered elsewhere	U.S. EPA (2019a)
	Electrical and electronic products	Electrical and electronic products	U.S. EPA (2019a)
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere	U.S. EPA (2019a)
	Furniture and furnishings not covered elsewhere	Furniture and furnishings not covered elsewhere	U.S. EPA (2019a)
	Lawn and garden care products	Lawn and garden care products	U.S. EPA (2019a)
	Non-TSCA	Non-TSCA	U.S. EPA (2019a)
	Paints and coatings	Paints and coatings	U.S. EPA (2019a)
	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	U.S. EPA (2019a)
Consumer Uses	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019a)
	Arts, crafts, and hobby materials	Arts, crafts, and hobby materials	U.S. EPA (2019a)
	Building/construction materials not covered elsewhere	Building/construction materials not covered elsewhere	U.S. EPA (2019a)
	Electrical and electronic products	Electrical and electronic products	U.S. EPA (2019a)

Life-Cycle Stage	Category	Subcategory of Use	Reference
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere	U.S. EPA (2019a)
	Furniture and furnishings not covered elsewhere	Furniture and furnishings not covered elsewhere	U.S. EPA (2019a)
	Lawn and garden care products	Lawn and garden care products	U.S. EPA (2019a)
	Paints and coatings	Paints and coatings	U.S. EPA (2019a)
	Plastic and rubber products not covered elsewhere	Plastic and rubber products not covered elsewhere	U.S. EPA (2019a)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	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 Di-Ethylhexyl Phthalate, Reporting Year 2011

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271
	Import	Footwear manufacturing	3162
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259

Activity Type	Activity	Industry Group	NAICS Code
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other electrical equipment and component manufacturing	3359
		Chemical and allied products merchant wholesalers	4246
	Produce or import for on-site use/processing	Footwear manufacturing	3162
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other electrical equipment and component manufacturing	3359
	Produce or import for sale/distribution	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Chemical and allied products merchant wholesalers	4246
	Produce or import as a byproduct	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271
	Produce or import as an impurity	Other chemical product and preparation manufacturing	3259
Processing	Process as a reactant	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Rubber product manufacturing	3262
		Motor vehicle manufacturing	3361
	Process as an article component	Textile and fabric finishing and fabric coating mills	3133
		Pharmaceutical and medicine manufacturing	3254
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262

Activity Type	Activity	Industry Group	NAICS Code
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Electrical equipment manufacturing	3353
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
	Process as an impurity	Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
	Process as a formulation component	Textile furnishings mills	3141
		Footwear manufacturing	3162
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Industrial machinery manufacturing	3332
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Basic chemical manufacturing	3251

Activity Type	Activity	Industry Group	NAICS Code
	Process – repackaging	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
Otherwise Use	Otherwise use – as a chemical processing aid	Pharmaceutical and medicine manufacturing	3254
		Rubber product manufacturing	3262
		Agriculture, construction, and mining machinery manufacturing	3331
		Motor vehicle manufacturing	3361
	Otherwise use – as a manufacturing aid	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
	Otherwise use – ancillary or other use	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Motor vehicle manufacturing	3361
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Textile furnishings mills	3141
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271

Activity Type	Activity	Industry Group	NAICS Code
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Alumina and aluminum production and processing	3313
		Nonferrous metal (except aluminum) production and processing	3314
		Other fabricated metal product manufacturing	3329
		Industrial machinery manufacturing	3332
		Electrical equipment manufacturing	3353
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Energy recovery	Textile and fabric finishing and fabric coating mills	3133
		Textile furnishings mills	3141
		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
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Agriculture, construction, and mining machinery manufacturing	3331
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361

Activity Type	Activity	Industry Group	NAICS Code
		Medical equipment and supplies manufacturing	3391
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Recycling	Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other nonmetallic mineral product manufacturing	3279
		Nonferrous metal (except aluminum) production and processing	3314
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
	Treatment	Textile and fabric finishing and fabric coating mills	3133
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pesticide, fertilizer, and other agricultural chemical manufacturing	3253
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Other nonmetallic mineral product manufacturing	3279
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361

Activity Type	Activity	Industry Group	NAICS Code
		Medical equipment and supplies manufacturing	3391
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622

Reference: U.S. EPA, 2019b

Table 5. Activities and Uses Reported to TRI for Di-Ethylhexyl Phthalate, Reporting Year 2015

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Clay product and refractory manufacturing	3271
	Import	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
	Produce or import for on-site use/processing	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
	Produce or import for sale/distribution	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
	Produce or import as a byproduct	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Clay product and refractory manufacturing	3271
	Produce or import as an impurity	Other chemical product and preparation manufacturing	3259
Process	Process as a reactant	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Plastics product manufacturing	3261
	Process as an article component	Textile and fabric finishing and fabric coating mills	3133
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Plastics product manufacturing	3261

Activity Type	Activity	Industry Group	NAICS Code
		Rubber product manufacturing	3262
		Alumina and aluminum production and processing	3313
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
	Process as an impurity	Other chemical product and preparation manufacturing	3259
	Process as a formulation component	Textile furnishings mills	3141
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
	Process – repackaging	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Chemical and allied products merchant wholesalers	4246
Otherwise Use	Otherwise use – as a chemical processing aid	Pharmaceutical and medicine manufacturing	3254
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262

Activity Type	Activity	Industry Group	NAICS Code
		Motor vehicle manufacturing	3361
	Otherwise use – as a manufacturing aid	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Paint, coating, and adhesive manufacturing	3255
		Rubber product manufacturing	3262
	Otherwise use – ancillary or other use	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Textile furnishings mills	3141
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271
		Cement and concrete product manufacturing	3273
		Alumina and aluminum production and processing	3313
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399

Activity Type	Activity	Industry Group	NAICS Code
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Energy recovery	Textile and fabric finishing and fabric coating mills	3133
		Textile furnishings mills	3141
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Other electrical equipment and component manufacturing	3359
		Chemical and allied products merchant wholesalers	4246
	Recycling	Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Waste treatment and disposal	5622
	Treatment	Textile and fabric finishing and fabric coating mills	3133
		Textile furnishings mills	3141
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254

Activity Type	Activity	Industry Group	NAICS Code
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622

Reference: U.S. EPA, 2019b

Table 6. Activities and Uses Reported to TRI for Di-Ethylhexyl Phthalate, Reporting Year 2017

Activity Type	Activity	Industry Group	NAICS Code
Manufacture	Produce	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Clay product and refractory manufacturing	3271
	Import	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Chemical and allied products merchant wholesalers	4246
	Produce or import for on-site use/processing	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Rubber product manufacturing	3262
		Chemical and allied products merchant wholesalers	4246
	Produce or import for sale/distribution	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Chemical and allied products merchant wholesalers	4246
	Produce or import as a byproduct	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Clay product and refractory manufacturing	3271
	Produce or import as an impurity	Other chemical product and preparation manufacturing	3259
Process	Process as a reactant	Basic chemical manufacturing	3251
		Plastics product manufacturing	3261
	Process as an article component	Textile and fabric finishing and fabric coating mills	3133
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Glass and glass product manufacturing	3272
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
	Process as an impurity	Other chemical product and preparation manufacturing	3259
	Process as a formulation component	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261

Activity Type	Activity	Industry Group	NAICS Code
		Rubber product manufacturing	3262
		Agriculture, construction, and mining machinery manufacturing	3331
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
	Process – repackaging	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Chemical and allied products merchant wholesalers	4246
Otherwise Use	Otherwise use – as a chemical processing aid	Pharmaceutical and medicine manufacturing	3254
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
	Otherwise use – as a manufacturing aid	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Paint, coating, and adhesive manufacturing	3255
		Plastics product manufacturing	3261
	Otherwise use – ancillary or other use	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Cement and concrete product manufacturing	3273
		Waste treatment and disposal	5622
Waste Management	Disposal/ releases	Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Paint, coating, and adhesive manufacturing	3255
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261

Activity Type	Activity	Industry Group	NAICS Code
		Rubber product manufacturing	3262
		Clay product and refractory manufacturing	3271
		Glass and glass product manufacturing	3272
		Cement and concrete product manufacturing	3273
		Agriculture, construction, and mining machinery manufacturing	3331
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
		Other miscellaneous manufacturing	3399
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Energy recovery	Textile and fabric finishing and fabric coating mills	3133
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Cement and concrete product manufacturing	3273
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Recycling	Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252

Activity Type	Activity	Industry Group	NAICS Code
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other fabricated metal product manufacturing	3329
		Navigational, measuring, electromedical, and control instruments manufacturing	3345
		Other electrical equipment and component manufacturing	3359
		Medical equipment and supplies manufacturing	3391
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622
	Treatment	Textile and fabric finishing and fabric coating mills	3133
		Basic chemical manufacturing	3251
		Resin, synthetic rubber, and artificial and synthetic fibers and filaments manufacturing	3252
		Pharmaceutical and medicine manufacturing	3254
		Other chemical product and preparation manufacturing	3259
		Plastics product manufacturing	3261
		Rubber product manufacturing	3262
		Other electrical equipment and component manufacturing	3359
		Motor vehicle manufacturing	3361
		Medical equipment and supplies manufacturing	3391
		Chemical and allied products merchant wholesalers	4246
		Waste treatment and disposal	5622

Reference: U.S. EPA, 2019b

CDR and TRI Summary and Additional Information on Conditions of Use

The number of DEHP manufacturers (including importers) and processors reporting to CDR increased over 65 percent from the 2012 reporting cycle (12 reporters) to the 2016 reporting cycle (20 reporters). While the use of DEHP is relatively consistent between the two reporting periods, the names of the reporting companies/sites are not.

Industrial uses of DEHP reported for both the 2012 and 2016 CDR reporting periods include the following:

- All other basic organic chemical manufacturing
- Custom compounding of purchased resins
- Miscellaneous manufacturing
- Non-TSCA use
- Paint and coating manufacturing
- Plastic material and resin manufacturing
- Plastics product manufacturing

Commercial/consumer uses of DEHP reported for both the 2012 and 2016 CDR reporting periods include the following:

- Building/construction materials not covered elsewhere
- Electrical and electronic products
- Fabric, textile, and leather products not covered elsewhere
- Furniture and furnishings not covered elsewhere
- Paints and coatings
- Plastic and Rubber Products not covered elsewhere

Between the 2016 and 2012 CDR reporting cycles, industrial, commercial, and consumer uses varied in several categories. One 2016 CDR reporter processed DEHP as a reactant in plastic material and resin manufacturing, rubber product manufacturing, and synthetic rubber manufacturing. One 2012 CDR reporter processed DEHP as a reactant in adhesives and sealant chemicals. DEHP was processed-repackaged during the 2016 CDR reporting period, but not during the 2012 reporting period.

Industrial uses of DEHP that appear in 2016 CDR data, but not 2012 CDR data include: all other basic inorganic chemical manufacturing; adhesive manufacturing; cyclic crude and intermediate manufacturing; food, beverage, and tobacco product manufacturing; medical devices; rubber product manufacturing; and services. The industrial use of DEHP in all other chemical product and preparation manufacturing appeared in the 2012 CDR data, but not in the 2016 CDR data.

DEHP was reported as a commercial/consumer use in food packaging and in personal care products in the 2016 CDR data, but not in the 2012 CDR data. DEHP was reported as a commercial/consumer use in adhesives and sealants; arts, crafts and hobby materials; and lawn and garden care products in the 2012 CDR data, but not in the 2016 CDR data.

One commercial/consumer use in the 2016 CDR reporting cycle was claimed as confidential business information[8]; no reports in 2012 CDR reporting cycle were CBI. Consumer uses were also identified in additional databases, which are included in the Exposure Potential section (Section 8).

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, Table 5, and Table 6 present the activities and uses reported to TRI by industry group for 2011, 2015, and 2017. Waste management activity type include all industry groups that reported to TRI using each waste management activity for di-ethylhexyl phthalate.

During the public comment period (March 21, 2019 to June 19, 2019) for the Initiation of Prioritization under TSCA, EPA received six comments in the docket for di-ethylhexyl phthalate, and two of those comments related to conditions of use. One commenter identified specific uses of DEHP in the aerospace industry (EPA-HQ-OPPT-2018-0433-0004): "The aerospace industry uses di-2-ethylhexyl phthalate (DEHP) as well as products and formulations containing DEHP in the manufacture, operations and maintenance of aerospace products. DEHP is used in adhesives, lacquers, tapes, coatings, Tygon® tubing and processing aids. As a constituent of products, DEHP was identified within epoxy adhesives, self-leveling compounds, and very specific applications such as aluminum pigmented coatings on fasteners or processing aids such as maskants, stop-off materials, strippable coatings, pressure pads in composite processing or tape used in temporary protection of aircraft parts. To illustrate the varied usage, it was also found within the color cartridge used in inkjet printing of markers and placards. These materials are qualified for use in federal, military, industry and company proprietary specifications."

Another commenter explained that DEHP is used in plasticizers and provided additional information about the use of di-ethylhexyl phthalate: "It's used as an additive and found as an impurity in coatings, sealants and adhesives. Specialty products may contain amounts above 10%" (EPA-HQ-OPPT-2018-0433-0003).

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

4. Potentially exposed or susceptible subpopulations

Approach

In this review, EPA considered reasonably available information to identify potentially exposed or susceptible subpopulations, such as children, women of reproductive age, workers, consumers or the elderly. EPA analyzed processing and use information included on the CDR Form U.

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

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 DEHP.

Children

EPA used data reported to the 2012 and 2016 CDR to identify information on the uses in products and articles intended for children over time for DEHP. Based on the 2012 and 2016 CDR data, DEHP was not reported as used in consumer products intended for children. This is to be expected because in concentrations of more than 0.1 percent of DEHP, its use in any children's toy or childcare article was banned in 2008 by the Consumer Product Safety Commission (16 CFR part 1307).

In the existing assessments reviewed, there was no discussion on the susceptibility of children to DEHP. However, EPA identified potential developmental hazards that would impact any stage of children's development. Thus, children are included a potentially exposed susceptible subpopulation for DEHP.

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

EPA identified studies that observed developmental and reproductive effects following exposure to DEHP (Section 7, Table 10). Pregnant women are therefore included as a susceptible subpopulation with respect to DEHP.

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 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 DEHP's persistence and bioaccumulation.

Physical and Chemical Properties and Environmental Fate Tables

Table 7. summarize the physical and chemical properties and environmental fate characteristics of DEHP, respectively.

Table 7. Physical and Chemical Properties of Di-Ethylhexyl Phthalate

Property or Endpoint	Value[a]	Reference
Molecular Formula	$C_{24}H_{38}O_4$	CRC Handbook (Rumble, 2018)
Molecular Weight	390.557 g/mole	CRC Handbook (Rumble, 2018)
Physical State	Liquid	CRC Handbook (Rumble, 2018)
Physical Form	Colorless, oily liquid	HSDB (2015) citing NIOSH (2010)
Purity	99.7%; impurities include mainly other phthalates	HSDB (2015) citing ECB (2003)
Melting Point	−55 ºC	HSDB (2015) citing Haynes (2014)
Boiling Point	384 ºC	HSDB (2015) citing Haynes (2014)
	231 ºC at 5 mm Hg	HSDB (2015) citing O'Neil (2006)
Density	0.98 g/cm^3 at 25 ºC	HSDB (2015) citing Haynes (2014)
Vapor Pressure	1.42×10^{-7} mm Hg at 25 ºC [b]	HSDB (2015) citing Hinckley et al. (1990)
	9.75×10^{-6} at 25 ºC	HSDB (2015) citing Howard (1985)
Vapor Density	16.0 (relative vapor density to air =1)	HSDB (2015) citing Clayton and Clayton (1981)
Water Solubility	0.27 mg/L at 25 ºC	HSDB (2015) citing Defoe et al. (1990)
Log K_{OW}	7.6	HSDB (2015) citing De Bruijn et al. (1989)
Henry's Law Constant	2.7×10^{-7} atm m^3/mol at 25 ºC (calculated from measured vapor pressure and water solubility)	U.S. EPA (2012)
Flash Point	215 ºC	HSDB (2015) citing NFPA (2010)
Auto Flammability	390 ºC	HSDB (2015) citing NFPA (2010)
Viscosity	22 cSt at 20 ºC, 386 cSt at 0 ºC, and 5 cSt at 100 ºC	HSDB (2015) citing O'Neil (2013)
Refractive Index	1.48 at 20 ºC	HSDB (2015) citing Haynes (2014)
Dielectric Constant	4.3 (60 Hz, 100 ºC)	HSDB (2015) citing Kirk-Othmer (1984)
Surface Tension	ca. 32.2 mN/m at 20 ºC	ECHA (2019)

Notes: [a]Measured unless otherwise noted; [b]Selected value; K_{OW} = octanol-water partition coefficient

Table 8. Table . Environmental Fate Characteristics of Di-Ethylhexyl Phthalate

Property or Endpoint	Value[a]	Reference
Direct Photodegradation	di-ethylhexyl phthalate contains chromophores that absorb at wavelengths >290 nm and will undergo photolysis; irradiation with a 300 W xenon lamp resulted in the decomposition of this compound with gaseous carbon dioxide being one of the main products 2-ethyl-1-hexene, 2-ethylhexanol, and phthalic acid were major byproducts	HSDB (2015) citing Kawaguchi (1994)
	Direct photolysis and photooxidation are not likely to be important removal pathways	ATSDR (2002) citing Wams (1987)
	$t_{1/2}$ = <2 days	HSDB (2015) citing Cadogan et al. (1994)
Indirect Photodegradation	$t_{1/2}$ = 5.85 hours (based on ·OH reaction rate constant of 21.96 × 10^{-12} cm^3/mol·second at 25 ºC and 1.5 × 10^6 ·OH radicals/cm^3) (estimated)[b]	U.S. EPA (2012)
Hydrolysis	$t_{1/2}$ = 2,000 years (pH 7; calculated)	HSDB (2015) citing Staples et al. (1997) (calculated from data in Wolfe et al. 1980)
Biodegradation (Aerobic)	In a static flask test with domestic wastewater as the inoculum, degradation increased weekly as adaptation increased. Weekly degradation from week 0-3 were 0, 43, 80, and 95%.	HSDB (2015) citing Tabak et al. (1981)
	$t_{1/2}$ = 0.8 days (activated sludge)	HSDB (2015) citing Saeger and Tucker (1976)
	>64% removal in activated sludge reactor and a biological aerated filter	HSDB (2015) citing Clapp et al. (1994)
	$t_{1/2}$ = 4.5 weeks (river water) $t_{1/2}$ = 14 days (hydrosoil)	HSDB (2015) citing Wams (1987)
	Over 63 days 34–50% in Neuherburg soil at pH 7.2 28–41% in Ebersberger Forest soil at pH 3.4 24–36% in Baierbrunn soil at pH 4.5	HSDB (2015) citing Doerfler et al. (1996)
Biodegradation (Anaerobic)	83.3% (municipal sludge)	HSDB (2015) citing Parker et al. (1994)
	0%/278 days (municipal solid waste samples)	HSDB (2015) citing Ejlertsson et al. (1996)

Property or Endpoint	Value[a]	Reference
	$t_{1/2}$ = 198 days, 173 days (anaerobic sludge)	HSDB (2015) citing Gavala et al. (2003)
Wastewater Treatment	$t_{1/2}$ = 23 days (wastewater treatment plants)	HSDB (2015) citing Byrns (2001)
	94% total removal (0.78% by biodegradation, 93% by sludge adsorption, and 0% by volatilization to air; estimated)[b]	U.S. EPA (2012)
Bioconcentration Factor	1,380 (*Pimephales promelas*)	ECHA (2019)
	582–614, 737–891 (*Pimephales promelas*)	ECHA (2019)
	850 (*Pimephales promelas*)	HSDB (2015) citing Veith et al. (1979)
	199 (*Lepomis macrochirus*)	HSDB (2015) citing Barrows et al. (1980)
Soil Organic Carbon:Water Partition Coefficient (Log K_{OC})	4.9–6	ATSDR (2002) citing Staples et al. (1997)
	4–5 in clays and sediments	HSDB (2015) citing Sullivan et al. (1982)

Notes:
[a]Measured unless otherwise noted
[b]EPI Suite™ physical property inputs: Log K_{OW} = 7.60, BP = 384 ºC, MP = –55 ºC, VP = 1.42 × 10^{-7} mm Hg, WS = 0.27 mg/L
K_{OC} = organic carbon-water partition coefficient; ·OH = hydroxyl radical

Results and Discussion

DEHP is a clear, oily liquid with low water solubility (0.27 mg/L). Based on its measured vapor pressure (1.42 × 10^{-7} mm Hg) and estimated Henry's Law constant (2.7 × 10^{-7} atm-m^3/mole), DEHP is not expected to volatilize from soil or water surfaces. The measured soil adsorption coefficient (Log K_{OC} of 4–6) indicates that DEHP will likely be immobile in soil and, therefore, is unlikely to leach into groundwater. If released directly to the air, DEHP in the vapor phase will be susceptible to both direct (half-life <2 days) and indirect (estimated half-life of 5.85 hours for reaction with photochemically-generated hydroxy radicals) photodegradation, whereas particulate DEHP may be removed via wet and dry precipitation.

DEHP has half-lives for aerobic biodegradation from 0.8 days in activated sludge to 14 days in hydrosoil to 4.5 weeks in river water. In addition, DEHP biodegraded up to 95 percent in 3 weeks using a wastewater sludge and 24–50 percent over 63 days in varying soils with a pH range of 3.4–7.2. DEHP has anaerobic half-lives of 173 and 198 days using sludge. Based on these data, DEHP is expected to have low to moderate persistence in the environment. Measured bioaccumulation concentration factors of 199 – 1,380 in various fish indicate that it is expected to have low to moderate potential to bioaccumulate.

6. Storage near significant sources of drinking water

Approach

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

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

Results and Discussion

EPA has designated DEHP as a Hazardous Air Pollutant under CAA, a toxic pollutant under CWA, and a hazardous substance under CERCLA. DEHP is also subject to reporting requirements under EPCRA.

Under CWA section 304, DEHP is included in the list of total toxic organics (TTO) (40 CFR 413.02(i)). DEHP is designated as a toxic pollutant under section 307(a)(1) of the CWA and as such is subject to several effluent limitations (40 CFR 401.15). DEHP is subject to National Primary Drinking Water Regulations (NPDWR) under the SDWA with a Maximum Contaminant Level Goal (MCLG) of zero and an enforceable Maximum Contaminant Level (MCL) of 0.006 mg/L (40 CFR 141.24). On January 11, 2017, EPA announced a review of the eight existing NPDWRs (82 FR 3518), and DEHP is one of those eight NPDWRs.

DEHP is considered a hazardous substance and releases in quantities equal to or greater than 100 pounds are subject to reporting to the National Response Center under CERCLA.

DEHP is a hazardous waste under the Resource Conservation and Recovery Act (RCRA), hazardous waste code U028 (Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof). 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 DEHP (Tables 9 and Table 10, respectively).

Because, there are very few publicly available assessments for DEHP with cited environmental hazard data. EPA used the infrastructure of ECOTOXicology knowledgebase (ECOTOX) to identify single chemical toxicity data for aquatic and terrestrial life (U.S. EPA, 2018a). It uses a comprehensive chemical-specific literature search of the open literature that is conducted according to the Standard Operating Procedures (SOPs)[9]. 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 DEHP, if available, to fill in potential data gaps when there were no reported observed effects for specific taxa exposed to the DEHP (Table 10).

Summary

EPA identified potential human health and environmental hazards based on a review of the reasonable available information for DEHP (Tables 9 and 10, respectively).

Table 9. Potential Human Health Hazards Identified for Di-Ethylhexyl Phthalate

Human Health Hazards	Tested for Specific Effect	Effect Observed	Reference
Acute Toxicity	X		CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), ATSDR (2002), RIVM (2001), OEHHA (1997), NICNAS (2013)
Repeated Dose Toxicity	X	X	CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR (2006), ATSDR (2002), RIVM (2001), OEHHA (1997), NTP (1982), NICNAS (2013)
Genetic Toxicity	X		IARC (2013), CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), ATSDR (2002), OEHHA (2002), RIVM (2001), OEHHA (1997), U.S. EPA (1987), NTP (1982), NICNAS (2013)
Reproductive Toxicity	X	X	UNEP (2016), FDA (2012), CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR (2006), OEHHA (2005), ATSDR (2002), RIVM (2001), OEHHA (1997), NICNAS (2013)
Developmental Toxicity	X	X	CPSC (2014), FDA (2012), CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR (2006), OEHHA (2005), ATSDR (2002), RIVM (2001), OEHHA (1997), NICNAS (2013)
Toxicokinetics	X	X	IARC (2013), CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR (2006), OEHHA (2005), ATSDR (2002), OEHHA (2002), RIVM (2001), OEHHA (1997), NTP (1982), FDA (2004), NICNAS (2013)

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

Human Health Hazards	Tested for Specific Effect	Effect Observed	Reference
Irritation/Corrosion	X		CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), ATSDR (2002), OEHHA (1997), NICNAS (2013)
Dermal Sensitization	X		CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), ATSDR (2002), NICNAS (2013)
Respiratory Sensitization			
Carcinogenicity	X	X	NTP (2016), CPSC (2014), IARC (2013), CPSC (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR 2006, ATSDR (2002), OEHHA (2002), RIVM (2001), OEHHA (1997), U.S. EPA (1987), NTP (1982), OEHHA (2011), NICNAS (2013)
Immunotoxicity			
Neurotoxicity	X	X	CPSC (2010), ATSDR (2002)
Epidemiological Studies or Biomonitoring Studies	X	X	NTP (2016), CPSC (2014), IARC (2013), CPSC (2010), ECHA (2010), NICNAS (2010), ECB (2008), NICNAS (2008), NTP-CERHR (2006), OEHHA (2005), ATSDR (2002), OEHHA (1997), U.S. EPA (1987), NTP (1982)

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 Di-Ethylhexyl Phthalate

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7)		Isomers of Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7) Isooctyl Phthalate (CASRN 27554-26-3)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
Aquatic	Acute exposure	Vegetation	7	X	1	X	Adams et al. (1995); Adema et al. (1981); Kevekordes (2001)
		Invertebrate	36	X	3	X	Adams and Heidolph (1985); Adams et al. (1995); Adema et al. (1981); Forget-Leray et al. (2005); Horne et al. (1983); Jonsson and Baun (2003); Jordao et al. (2015); LeBlanc (1980); Lee et al. (2006); Linden et al. (1979); Liu et al. (2009); Mayer and Ellersieck (1986); Morales et al. (2011); Orbea et al. (2002); Park and Kwak (2008a); Park and Kwak (2008b); Park and Kwak (2009a); Park and Kwak (2009b); Park and Kwak (2010); Park and Kwak (2012); Planello et al. (2011); Sauvant et al. (1995a); Sauvant et al., (1995b); Scanlan et al. (2015); Scholz (1995); Seo et al. (2006); Streufert (1977); Yang et al., (2009)
		Fish	31	X	5	X	Adams et al. (1995); Adema et al. (1981); Ahmadivand et al. (2015); Birge et al. (1979); Birge et al. (1982b); Bizarro et al. (2016); Buccafusco et al. (1981); Canton et al. (1984); Cravedi and Perdu-Durand

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7)		Isomers of Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7) Isooctyl Phthalate (CASRN 27554-26-3)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
							(2002); E.G. and G. Bionomics (1983); Geiger et al. (1990); Guo et al. (2015); Heitmuller et al. (1981); Horne et al. (1983); Jee et al. (2009); Maradonna et al. (2013); Mayer and Ellersieck (1986); Mayer (1976); Sabourault et al. (1999); Spehar (1986)
		Non-fish vertebrate (i.e., amphibians, reptiles, mammals)	–		–		
	Chronic exposure	Vegetation	2	X	–		Davis (1981); Richter (1982)
		Invertebrate	16	X	1	X	Adams and Heidolph (1985); Adema et al. (1981); Brown and Thompson (1982); Brown et al. (1998); Forget-Leray et al. (2005); Ganeshakumar (2009); Horne et al. (1983) Kim and Lee (2004); Kwak and Lee (2005); Orbea et al. (2002); Park and Kwak (2008a); Park and Kwak (2008b); Park and Kwak (2009a); Park and Kwak(2009b); Rhodes et al. (1995); Streufert (1977)
		Fish	23	X	–		Adema et al. (1981); Ahmadivand et al. (2015); Barrows et al. (1980); Birge et al.

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7)		Isomers of Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7) Isooctyl Phthalate (CASRN 27554-26-3)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
							(1979); Birge et al. (1982); Carnevali et al. (2010); Chikae et al. (2004); Crago and Klaper (2012); Henderson and Sargent (1983); Huang et al. (2015); Jee et al. (2009); Mayer (1976); Mehrle and Mayer (1976); Norman et al. (2007); Spehar (1986); Uren-Webster et al. (2010); Wang et al. (2013); Ye et al. (2014)
		Non-fish vertebrate (i.e., amphibians, reptiles, mammals)	–		–		
Terrestrial	Acute exposure	Vegetation	–		–		
		Invertebrate	3	X	–		Boyd et al. (2016); Lenoir et al. (2014); Zimmering et al, (1989)
		Vertebrate	4	X	–		Miyagawa et al. (1995); Narotsky and Kavlock (1995); Uno et al. (1994); Wilson et al. (2004)
	Chronic exposure	Vegetation	4	X	–		Hulzebos et al. (1993); Sun et al. (2015)
		Invertebrate	2	X	–		Jensen et al. (2001); Lenoir et al. (2014)

Media	Study Duration	Taxa Groups	High-Priority Chemical Candidate Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7)		Isomers of Di-Ethylhexyl Phthalate (1,2-Benzene-Dicarboxylic Acid, 1,2- Bis(2-Ethylhexyl) Ester) (CASRN 117-81-7) Isooctyl Phthalate (CASRN 27554-26-3)		Reference
			Number of Studies	Observed Effects	Number of Studies	Observed Effects	
		Vertebrate	12	X	–		Agarwal et al. (1986); Hardin et al. (1987);Hill et al. (1975); Lake et al. (1977); Ljungvall et al. (2006); Mizukami et al. (2010);Narotsky and Kavlock (1995); Oishi and Hiraga (1980); Oishi (1989); O'Shea and Stafford (1980); Peakall (1974)

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 used reasonably available information to identify potential environmental, worker/ occupational, consumer, and general population exposures for DEHP.

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 DEHP to inform occupational and consumer exposure potential. The results of this review is detailed in the following tables.

General population exposure

EPA identified environmental concentration, human and environmental biomonitoring data to inform DEHP's exposure potential to the general population (Table 13).

Results and Discussion

Release potential for environmental and human health exposure

Aggregated quantities of DEHP released on-site to air, water, and land, as well as aggregated quantities of DEHP transferred off-site to POTW and other wastewater treatment facilities (non-POTW) are presented in Table 11 above for Reporting Years 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 DEHP for Reporting Years 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 Di-Ethylhexyl Phthalate from Reporting Years 2011, 2015, and 2017 Used in this Document to Assess Exposure Potential[a]

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 POTWs (lbs.)	Total Quantities Transferred to Other (Non-POTWs) Wastewater Treatment Facilities (lbs.)
2011	197	35,909	2,187	26,241	1,709	409
2015	145	29,114	1,901	35,847	2,487	440
2017	131	44,235	842	16,957	2,131	41

POTWs = publicly owned treatment works

[a] Reference: U.S. EPA, 2019b

For Reporting Year 2017, 131 facilities submitted TRI reports for DEHP. The total quantities of DEHP these facilities released on-site to air (as fugitive and stack emissions), surface water and land are: 44,235 pounds; 842 pounds; and 16,957 pounds, respectfully. These facilities reported 2,131 pounds of the chemical transferred to POTW and 41 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 DEHP received by the non-POTW wastewater treatment facilities may have been released to surface waters or to air during treatment processes at the facilities.

When chemical substances are used as reactants and 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 reactants and chemical intermediates. The actual percentage and quantity of release of the reported chemical associated with this category 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 commercial or consumer use as adhesives and sealants, and paints and coating, they can have variable release percentages. If the chemical is used as a solvent, it may evaporate to the air during the drying or curing of the adhesive and/or paint or coating. Other additives may be entrained in the dried or cured adhesive or paint or coating but may be released to the environment due to abrasion of paint or coating. The actual percentage and quantity of release of the reported chemical associated with this category are not known but could be high.

When chemical substances have commercial or consumer use as lawn and garden products, the releases during end use may be a relatively high percentage of the production volume. Higher percentage releases occur when the product containing the chemical is used in a dispersive pattern on land. 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.

DEHP has an Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) (OSHA, 2009). The PEL is 5 milligrams (mg)/cubic meter (m^3) over an 8-hour workday, time weighted average (TWA). This chemical also has a National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (NIOSH, 2010) of 5 mg/m^3 TWA and a short-term exposure limit (STEL) of 10 mg/m^3. The American Conference of Governmental Industrial Hygienists (ACGIH) set the Threshold Limit Value (TLV) at 5 mg/m^3 TWA.

DEHP has a vapor pressure ranging from 1.42 x 10^{-7} mm Hg to 9.75 x 10^{-6} mm Hg at 25 ºC/ 77 °F. EPA assumes negligible inhalation exposure to vapors generated from liquids with vapor pressures below 0.001 mm Hg at ambient room temperature conditions.

DEHP is indicated as being used in adhesives and sealants, and paints and coatings. Products such as adhesive and sealants, and paints and coatings may be applied via spray or roll application methods. These methods may generate mists to which workers may be exposed.

Consumer exposure
Based on CDR reporting information, DEHP is widely used in consumer products, including adhesives, cleaners, electrical and electronic products and paint and coatings, among other products. The NIH Consumer Product Database and the Chemical and Products Database CPDat) indicated that DEHP is used in a number of consumer products (Table 12). In the most

recent assessments reviewed, use of DEHP was reported in a variety of consumer products, including tablecloths, shower curtains, furniture and automobile upholstery, floor tiles, shoes, food packaging materials, as well as in medical devices (NTP 2016, TERA 2015, IARC 2013, CPSC (2010), ECHA 2010, NICNAS 2010, ECB 2008, NICNAS (2008), NTP-CERHR 2006, OEHHA 2005, ATSDR 2002, OEHHA 1997, NICNAS 2013, FDA 2004). Consumer exposure to DEHP may occur through dermal exposure and through inhalation of contaminated air or dust containing di-ethylhexyl that migrated from consumer products (NTP 2016, TERA 2015, NICNAS 2010, NTP-CERHR 2006).

Table 12. Exposure Information for Consumers

Chemical Identity	Consumer Product Database
	Consumer Uses (List)
Di-Ethylhexyl Phthalate (117-81-7)	Adhesive, apparel bags, arts crafts products, automotive, automotive care, binding, building material, carpet, casting agent, cleaner, clothing, colorant, decor, electronics, filler, filler building material, fixative, flooring, fluid property modulator, footwear, fragrance, furniture, hardener, insulation, leather, metal surface treatment, paint, paint binding, photographic, plastic, plastic softener, pool chemicals, printing, printing ink, propellant, rubber, seal material, softener, solvent, sports equipment, stabilizer, textile, toys, wall building material

Reference: CPDat

General population exposure

Releases of DEHP from certain conditions of use, such as manufacturing and industrial use activities, may result in general population exposures via drinking water ingestion and inhalation from air releases. Exposure can also occur orally through consumption of food containing di-ethylhexyl phthalate, either through contamination from environmental sources or as a result of leaching from food packaging materials (TERA 2015, ATSDR 2002, OEHHA 1997). DEHP was detectable in air, water, soil/sediment, and other environmental media, as well as ecological biomonitoring matrices of aquatic non-mammals and other ecological matrices (Table 13).

Existing assessments also indicated DEHP was detected in ambient air, indoor air, surface water, groundwater, wastewater, landfill leachate, sediment, soil, diet, and sludge (NICNAS 2019, NTP 2016, IARC 2013, ECB 2008, NTP-CERHR 2006, ATSDR 2002, OEHHA 1997), as well as in aquatic invertebrates, fish, and monkeys (IARC 2013, ECB 2008, ATSDR 2002). In human matrices, DEHP has been detected in serum, breast milk, adipose tissue, cord blood and stored blood (NTP 2016, IARC 2013, ECB 2008, NTP-CERHR 2006, OEHHA 2005, ATSDR 2002, OEHHA 1997, NTP 1982), whereas metabolites of DEHP have been detected in urine, saliva, breast milk, cord blood, and serum (NTP 2016, CPSC 2014, IARC 2013, NICNAS 2010, ECHA 2010, ECB 2008, NTP-CERHR 2006, ATSDR 2002). Based on fate properties, such as soil organic carbon-water partition coefficient and Henry's Law constant, EPA anticipates possible presence of DEHP in soil, sediment, and water (NICNAS 2019, NTP 2016).

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	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	no	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	yes	no	yes	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	yes	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	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)
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 and concluded that DEHP 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, children). This is based on the potential hazard and potential exposure of DEHP 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 DEHP may result in presence of the presence of the chemical in surface water and in groundwater, 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 children. In addition, EPA expects potential environmental (e.g., aquatic toxicity, terrestrial toxicity) and human health hazards (e.g., repeated dose toxicity, reproductive toxicity, developmental toxicity, carcinogenicity, 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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