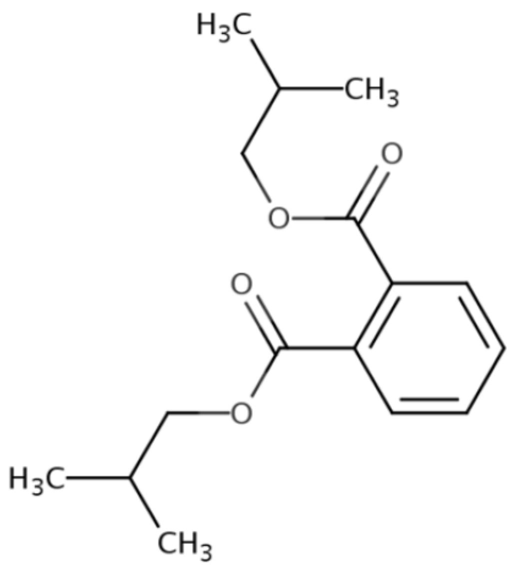
EPA Document# EPA-740-R-25-027
December 2025
Office of Chemical Safety and
Pollution Prevention

United States
Environmental Protection Agency

Risk Evaluation for Diisobutyl Phthalate (DIBP)

CASRN 84-69-5



December 2025

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ACKNOWLEDGEMENTS

The Assessment Team gratefully acknowledges the participation, input, and review comments from U.S. Environmental Protection Agency (EPA or the Agency) Office of Pollution Prevention and Toxics (OPPT) and Office of Chemical Safety and Pollution Prevention (OCSPP) senior managers and science advisors. The Agency is also grateful for assistance from EPA contractors Eastern Research Group, Inc. (Contract No. 68HERC23D0006); General Dynamics Information Technology, Inc. (Contract Nos. HHSN316201200013W and 68HERD24A0001); SRC, Inc. (Contract No. 68HERH19D0022); Spec Professional Services, LLC (Contract No. 68HERC20D0021); SpecPro Sustainable and Environmental, Inc. (Contract No. 68HERC25D0004); and ICF, Inc. (Contract Nos. 68HERC19D0003 and 68HERC23D0007).

Docket

Supporting information can be found in the public docket, Docket ID (EPA-HQ-OPPT-2018-0434).

Disclaimer

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EXECUTIVE SUMMARY

Background

EPA evaluated the chemical diisobutyl phthalate (DIBP) under the Toxic Substances Control Act (TSCA). In this risk evaluation, the Agency has determined that DIBP presents an unreasonable risk of injury to human health under four conditions of use (COUs) driven by identified risk to workers due to inhalation exposure to DIBP, including risks to occupational non-users (ONUs) under two of these COUs. DBP also presents an unreasonable identified risk of injury to the environment from two of the same COUs as identified for workers in addition to five other COUs—all of which are based on exposure to algae and chronic exposure to aquatic vertebrates from DIBP releases to surface water. Of the 28 COUs EPA evaluated, 19 were determined to not significantly contribute to unreasonable risk of DIBP to human health or the environment. No TSCA COUs significantly contribute to unreasonable risk to consumers or the general population.

In December 2019, EPA designated DIBP as a high-priority substance for TSCA risk evaluation and in August 2020 released the final scope of the risk evaluation (U.S. EPA, 2020c). The Agency released the *Draft Risk Evaluation for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025r) in August 2025. This final risk evaluation assesses human health risk to workers, including ONUs, consumers, and the general population exposed to DIBP from environmental releases. It also assesses risk to the environment. Manufacturers report DIBP production volumes through the Chemical Data Reporting (CDR) rule under the associated CAS Registry Number (CASRN) 84-69-5. The production volume for DIBP was approximately 400,000 pounds (lb) in 2019 based on the 2020 CDR data; review of preliminary 2024 CDR data shows that total production volumes for the years 2020 to 2023 are similar to the previously reported range from the 2020 CDR dataset. The Agency has evaluated DIBP across its COUs, ranging from manufacture to disposal.

DIBP is used primarily as a plasticizer in consumer, commercial, and industrial applications (Section 1.1.2). It is also used as a stabilizing agent in the manufacturing of adhesives, paint, coatings, and rubbers. Workers may be exposed to DIBP when making these products or otherwise using DIBP in the workplace (Section 4.1.1). When it is manufactured or used to make products, DIBP can be released into water, where because of its physical and chemical properties, most will end up in the sediment at the bottom of nearby lakes and rivers (Section 3.3.1.1). If released into the air (Section 3.3.1.2), DIBP will attach to dust particles and be deposit on land or into water. Indoors, DIBP has the potential over time to be released from products and also adhere to dust particles (Section 4.1.2). If it does, people could inhale or ingest dust that contains DIBP.

Laboratory animal studies have been conducted to determine whether exposure to DIBP can cause a range of non-cancer health effects in people. After reviewing the reasonably available studies, EPA concluded that there is strong evidence that DIBP causes developmental toxicity (a non-cancer hazard). The most sensitive adverse developmental effects include effects on the developing male reproductive system, based on studies in rodents, consistent with a disruption of androgen action—what is known as "phthalate syndrome," which results from decreased fetal testicular testosterone.

EPA included DIBP in a cumulative risk assessment (CRA) along with five other phthalates[1] that can cause effects on laboratory animals consistent with phthalate syndrome, as described in the *Technical Support Document for Cumulative Risk Analysis* (U.S. EPA, 2025ap). Assessments by Health Canada,

[1] The six phthalates in the cumulative assessment are butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), DCHP, diethylhexyl phthalate (DEHP), DIBP, and diisononyl phthalate (DINP).

U.S. Consumer Product Safety Commission (U.S. CPSC), European Chemicals Agency (ECHA), and the Australian National Industrial Chemicals Notification and Assessment Scheme (NICNAS) have reached similar conclusions regarding the developmental effects of DIBP. Those agencies also conducted CRAs of phthalates based on their shared ability to cause phthalate syndrome. Furthermore, independent, expert peer reviewers supported EPA's proposal to conduct a CRA of multiple phthalates under TSCA during the May 2023 meeting of the Science Advisory Committee on Chemicals (SACC; accessed December 21, 2025) because humans are co-exposed to multiple toxicologically similar phthalates that can cause phthalate syndrome.

In this risk evaluation, the Agency addressed cumulative exposure to phthalates using human biomonitoring data. Note that these cumulative phthalate exposures cannot be attributed to specific COUs or other sources under TSCA. This non-attributable, cumulative exposure and risk, representing the national population, was taken into consideration by EPA in its risk evaluation for DIBP. The CRA also considers differences in the ability of each phthalate to cause effects on the developing male reproductive system. Use of this "relative potency" provides a more robust risk assessment of DIBP as well as a common basis for adding risk across the six phthalates—BBP, DBP, DEHP, DCHP, DINP, and DIBP—included in the CRA. EPA has included the phthalate CRA as part of its risk characterization for DIBP in alignment with the 2008 National Research Council Report: *Phthalates and Cumulative Risk Assessment: The Task Ahead* (NRC, 2008). This risk evaluation describes analyses considering DIBP exposure under the COUs as the "individual assessment" or "single chemical assessment" and analysis also considering background exposure to other phthalates (*i.e.,* NHANES) as the "cumulative assessment."

Past assessments of DIBP from other government agencies that addressed a broad range of uses, which may have included TSCA and "non-TSCA" uses, have concluded that DIBP alone or in combination with exposure to other phthalate chemicals may pose a hazard and/or risk to human health based on its concentration in products and the environment. Notably, both the U.S. CPSC's and Health Canada's risk assessments included consideration of exposure from children's products as well as from other sources such as personal care products, diet, consumer products, and the environment. However, neither assessment specifically considered DIBP exposure to workers. In this risk evaluation, EPA identified risks to workers in four COUs for industrial and commercial uses of DIBP, including risks to ONUs under two of these COUs. However, the Agency did not find that DIBP contributes to unreasonable risk to consumers or the general population under any COU.

In this assessment, EPA evaluated whether manufacturing, processing, distribution in commerce, use, or disposal of DIBP presents unreasonable risk to human health or the environment under COUs subject to TSCA. Human or environmental exposure to DIBP through uses that are not subject to TSCA (*e.g.,* use in cosmetics, medical devices, food contact materials) were not evaluated by the Agency in reaching its determination of unreasonable risk to human health. This is because these uses are excluded from TSCA's definition of chemical substance under TSCA section 3(2)(B). Thus, though EPA is determining in this risk evaluation that nine specific COUs significantly contribute to its unreasonable risk determination for DIBP, this determination cannot be extrapolated to form conclusions about uses of DIBP that are not subject to TSCA, and that the Agency did not evaluate.

Determining Unreasonable Risk to Human Health

EPA's TSCA existing chemicals risk evaluations must determine whether a chemical substance does or does not present unreasonable risk to human health or the environment under its COUs. The unreasonable risk determination must be informed by the best available science. The Agency, in making the finding of *presents unreasonable risk to human health and the environment,* considers risk-related factors as described in its risk evaluation framework rule under TSCA (U.S. EPA, 2024). Risk-related factors beyond the levels of DIBP that can impact an unreasonable risk finding include but are not limited to the type of health effects under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), population exposed (including any potentially exposed or susceptible subpopulations [PESS]), and EPA's confidence in the information used to inform the hazard and exposure values. These considerations are included as part of a pragmatic and holistic evaluation of hazard and exposure to DIBP. If an estimate of risk for a specific scenario indicates that risk exceeds the standard risk benchmarks (*e.g.*, margin of exposure below the benchmark for non-cancer health effects), then determination of whether those risks significantly contribute to unreasonable risk of DIBP under TSCA is both case-by-case and context-driven. EPA considers the aforementioned risk-related factors when making a determination of whether a COU significantly contributes to unreasonable risk.

EPA evaluated the risks to people from being exposed to DIBP at work, indoors, and outdoors. In its human health evaluation, the Agency used a combination of screening level and more refined approaches to assess exposure to DIBP through breathing or ingesting dust or other particulates as well as through skin contact. EPA also released a cumulative risk technical support document including DIBP and five other phthalate chemicals that can all cause phthalate syndrome (U.S. EPA, 2025ap). Risks are characterized for occupational and consumer exposures to DIBP—alone as well as in combination with the measured cumulative phthalate exposure that is experienced by the U.S. population and that cannot be attributed to a specific COU as part of the CRA.

In determining whether DIBP presents an unreasonable risk of injury to human health, EPA considered the following PESS in its assessment (Section 4.3.5): females of reproductive age, pregnant women, infants, children and adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, people living in proximity to releasing facilities ("fenceline" communities), and Tribes and subsistence fishers whose diets include large amounts of fish. These subpopulations are PESS because some have greater exposure to DIBP per body weight (*e.g.,* infants, children, adolescents) while others may experience exposure from multiple sources or higher exposures than others.

EPA's robust screening analysis finds that exposure of the general population to DIBP does not contribute to unreasonable risk of injury to human health (Section 6.1.6). For consumers, the Agency has moderate or robust confidence in the risk estimates calculated for consumers' inhalation, ingestion, and dermal exposure scenarios, which EPA determined did not contribute to unreasonable risk. The Agency identified four COUs where occupational inhalation exposure to DIBP for workers significantly contributed to the unreasonable risk of injury to human health; risk from inhalation exposure to ONUs was also identified for two of these COUs. EPA has moderate confidence in the inhalation and dermal exposure estimates for female workers of reproductive age and average adult workers. EPA has slight to moderate confidence in the assessed inhalation and dermal exposures for ONUs.

Determining Unreasonable Risk to the Environment

In determining whether DIBP presents an unreasonable risk of injury to the environment, EPA considered the following groups of organisms in its assessment: aquatic vertebrates, invertebrates, plants, and algae; benthic invertebrates; soil invertebrates; and terrestrial mammals and plants. The Agency weighed the scientific evidence in order to determine confidence levels in underlying datasets and risk estimates for the environment (Section 5.3). EPA's confidence in environmental data and risk estimates ranges from slight to moderate for surface water, sediment pore water, and sediment—depending on the source of environmental release information for each COU (Section 5.3.4). EPA has robust confidence in its environmental risk estimates for air to soil deposition, biosolids, landfills, and trophic transfer from water or soil (Section 5.3.4). The Agency has determined that DIBP presents unreasonable risk to the environment based on exposure to algae and chronic exposure to vertebrates from DIBP releases to surface water under seven COUs.

Summary, Considerations, and Next Steps

EPA has determined that of the 28 COUs evaluated, 4 significantly contribute to the unreasonable risk to human health due to inhalation exposure to DIBP for workers, including 2 COUs with risk to ONUs due to inhalation exposure. DBP also presents an unreasonable identified risk of injury to the environment from two of the same COUs as identified for workers in addition to five other COUs based on DBP exposure to algae and aquatic vertebrates in surface water.

The acute inhalation exposure to workers is the primary route contributing to the aggregate and cumulative exposure for workers.[2] For consumers and for the general population, the Agency has determined that no COUs significantly contribute to unreasonable risk.

EPA has determined that the following four COUs significantly contribute to unreasonable risk of DIBP to workers—and two COUs to ONUs—due to inhalation exposure:

- Industrial Use – Adhesives and sealants – Two-component glues and adhesives; transportation equipment manufacturing (inhalation exposure for workers and ONUs from spray applications);
- Industrial Use – Paints and coatings (inhalation exposure for workers from spray applications);
- Commercial Use – Adhesives and sealants – Two-component glues and adhesives (inhalation exposure for workers and ONUs from spray applications); and
- Commercial Use – Paints and coatings (inhalation exposure for workers from spray applications).

EPA has determined that the following seven COUs significantly contribute to unreasonable risk of DIBP to the environment based on exposure to algae and chronic exposure to aquatic vertebrates from DIBP releases to surface water:

- Industrial Use – Paints and coatings;
- Commercial Use – Paints and coatings;
- Processing – Incorporation into article – Plasticizers (plastic product manufacturing; transportation equipment manufacturing);
- Processing – Incorporation into formulation, mixture, or reaction product – Plasticizer (adhesive manufacturing; plastic product manufacturing);
- Processing – Incorporation into formulation, mixture, or reaction product – Solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paints and coatings);
- Processing – Incorporation into formulation, mixture, or reaction product – Processing aids, not otherwise listed; and
- Processing – Incorporation into formulation, mixture, or reaction product – Pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production).

EPA is determining that the following 19 COUs do *not* significantly contribute to unreasonable risk:

[2] The Agency conducted analyses on aggregate exposures and cumulative risks. Aggregate exposure analyses consider effects on populations that are exposed to DIBP via multiple routes (*e.g.*, dermal contact, ingestion, inhalation). Cumulative risk refers to human health risks related to exposures to multiple chemicals with similar effects (*i.e*., aggregate + NHANES = cumulative). See Section 4.4 for more information.

- Manufacturing – Domestic manufacturing;
- Manufacturing – Import;
- Processing – Incorporation into formulation, mixture, or reaction product – Foam pipeline pigs;
- Processing – Incorporation into formulation, mixture, or reaction product – Plastic and rubber products not covered elsewhere;
- Processing – As a reactant – Intermediate (plastic manufacturing);
- Processing – Repackaging – Repackaging (*e.g.*, laboratory chemicals);
- Processing – Recycling;
- Distribution in Commerce;
- Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial Use – Toys, playground, and sporting equipment;
- Commercial Use – Laboratory chemicals – Laboratory chemicals;
- Consumer Use – Adhesives and sealants – Adhesives and sealants;
- Consumer Use – Fabric, textile, and leather products not covered elsewhere;
- Consumer Use – Floor coverings – Floor coverings;
- Consumer Use – Toys, playground, and sporting equipment – Toys, playground, and sporting equipment;
- Consumer Use – Paints and coatings – Paints and coatings;
- Consumer Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); and
- Disposal.

There were no COUs that significantly contribute to unreasonable risk of DIBP to consumers or the general population.

Recommendations from public comments on the DIBP draft risk evaluation and recommendations from the August 2025 SACC review of the DIBP human health and environmental hazard assessments were used to inform this final risk evaluation. As a next step, EPA will initiate risk management for DIBP by applying one or more of the requirements under TSCA section 6(a) to the extent necessary so that DIBP no longer presents an unreasonable risk. The Agency expects risk management requirements to focus on those COUs that significantly contribute to the determination of unreasonable risk of DIBP. Due to acute inhalation risk presented in the single chemical analysis being the driver of the unreasonable risk for the occupational COUs, and because the cumulative analysis is not applicable to the analysis of risk to environmental receptors, EPA's risk management will focus on the risk presented in the single chemical analysis of DIBP.

1 INTRODUCTION

EPA has evaluated diisobutyl phthalate (DIBP) under section 6(b) of the Toxic Substances Control Act (TSCA). DIBP is primarily used as a plasticizer in consumer, commercial, and industrial applications—although it is also used in adhesives, sealants, paints, coatings, rubbers, and non-PVC plastics as well as for other applications. Section 1.1 summarizes the scope of this DIBP risk evaluation, including information on DIBP production volume, a life cycle diagram (LCD), TSCA conditions of use (COUs), conceptual models used for DIBP, and an overview of the populations (including subpopulations) and durations of exposure assessed. Section 1.2 presents the organization of the remainder of the risk evaluation.

Figure 1-1 provides an overview of the major inputs, phases/components, and outputs of the TSCA risk evaluation process, from chemical prioritization to scoping to releasing the final risk evaluation.

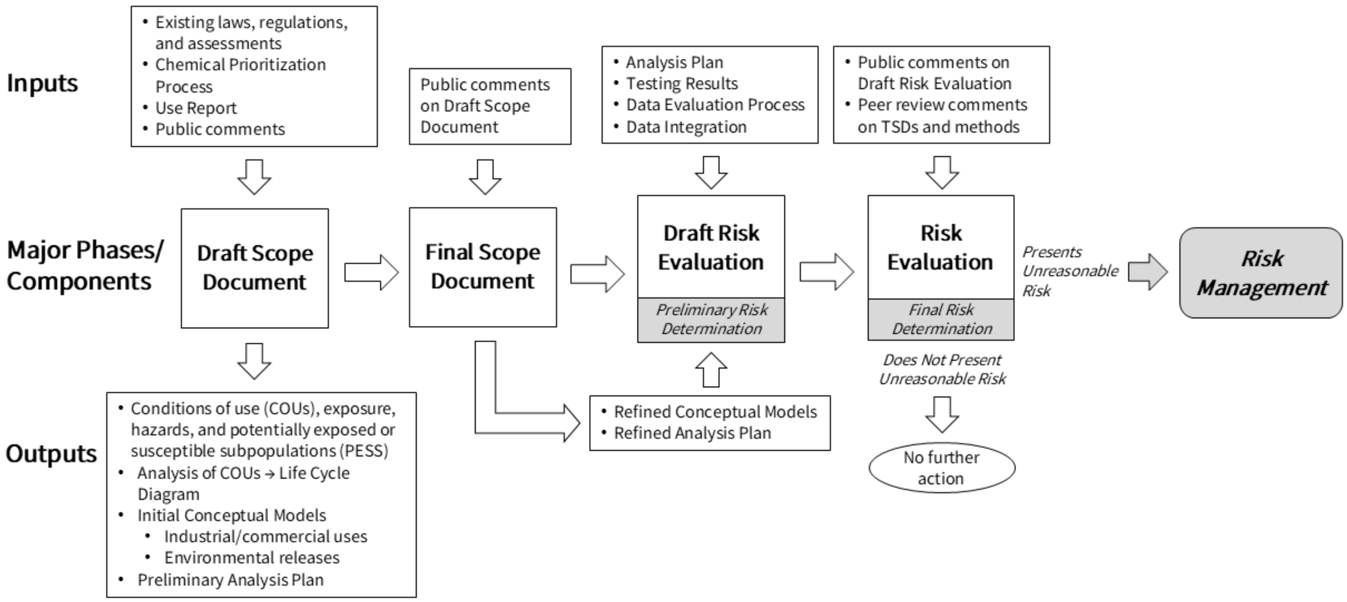

Figure 1-1. Overview of TSCA Existing Chemical Risk Evaluation Process

1.1 Scope of the Risk Evaluation

EPA evaluated risk to human health and the environment for DIBP. Specifically for human populations, the Agency evaluated risk to workers and occupational non-users (ONUs) via inhalation and dermal routes for occupational exposure scenarios (OESs) that involve mists and dusts; risk to consumers via inhalation, dermal, and oral routes; and risk to bystanders via the inhalation route. Additionally, EPA considered the following potentially exposed or susceptible populations (PESS) in its assessment: females of reproductive age, pregnant women, infants, children and adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, and Tribes and subsistence fishers whose diets include large amounts of fish. As described further in Section 4.1.3, EPA assessed risks to the general population, including considerations for fenceline populations, from environmental releases using a screening level analysis that considered risk from exposure to DIBP via inhalation of air emissions, and ingestion of surface water, drinking water, fish, and soil from air emissions that deposit onto soil. As described further in Section 4.1.3, EPA assessed risks to the general population, including considerations for fenceline populations, from environmental releases using a screening level analysis that considered risk from exposure to DIBP via inhalation of air emissions, and ingestion of surface water, drinking water sourced from surface water, fish, and soil from air emissions that deposit onto soil. EPA also considered risk via the land pathway (*i.e.*, exposure through soil or groundwater from application of biosolids of landfills) qualitatively. For environmental receptor populations, the Agency evaluated risk to aquatic species via water, sediment, and air as well as risk to terrestrial species via air, soil, sediment, and water.

Consistent with EPA's *Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c), EPA also released a cumulative risk technical support document (TSD) of DIBP and five other toxicologically similar phthalates: diethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), dicyclohexyl phthalate (DCHP), butyl benzyl phthalate (BBP), and diisononyl phthalate (DINP). These phthalates are also being evaluated under TSCA based on a common toxicological endpoint ("phthalate syndrome," which results from decreased fetal testicular testosterone) (U.S. EPA, 2025ap). The cumulative risk analysis takes into consideration differences in phthalate potency to cause effects on the developing male reproductive system. Use of relative potency across the phthalates provides a common basis for adding risk across the cumulative phthalates.

Numerous other regulatory agencies—Health Canada, U.S. Consumer Product Safety Commission (U.S. CPSC), European Chemicals Agency (ECHA), and the Australian National Industrial Chemicals Notification and Assessment Scheme (NICNAS)—have assessed phthalates for cumulative risk. Further, EPA's proposal to conduct a CRA of phthalates under TSCA was supported by the Science Advisory Committee on Chemicals (SACC) (U.S. EPA, 2025al, 2023e). As described further in Sections 4.4, cumulative risk considerations focus on acute duration exposures to the most susceptible subpopulations: female workers and consumers of reproductive age (16–49 years) as well as male infants and male children (3–15 years) exposed to consumer products and articles.

This DIBP risk evaluation includes a series of TSDs, each of which contains sub-assessments that inform adjacent, "downstream" TSDs and related supplemental documents and files. A basic diagram showing the layout and relationship of these assessments is provided below in Figure 1-2. High-level summaries of each relevant TSD are presented in this risk evaluation. Detailed information for each can be found in the corresponding documents. Appendix C incudes a list and citations for all TSDs and supplemental documents and files included in this risk evaluation for DIBP.

These TSDs leveraged the data and information sources already identified in the *Final Scope of the Risk Evaluation for Di-isobutyl Phthalate (1,2-benzenedicarboxylic acid, 1,2-bis(2-methylpropyl) ester); CASRN 84-69-5* (also referred to as the "final scope document" or "final scope") (U.S. EPA, 2020c). OPPT conducted a comprehensive search for "reasonably available information" to identify relevant DIBP data for use in the risk evaluation. The approach used to identify specific relevant risk assessment information was discipline-specific and is detailed in *Systematic Review Protocol for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025ao), or as otherwise noted in the relevant TSDs and supplemental documents and files.

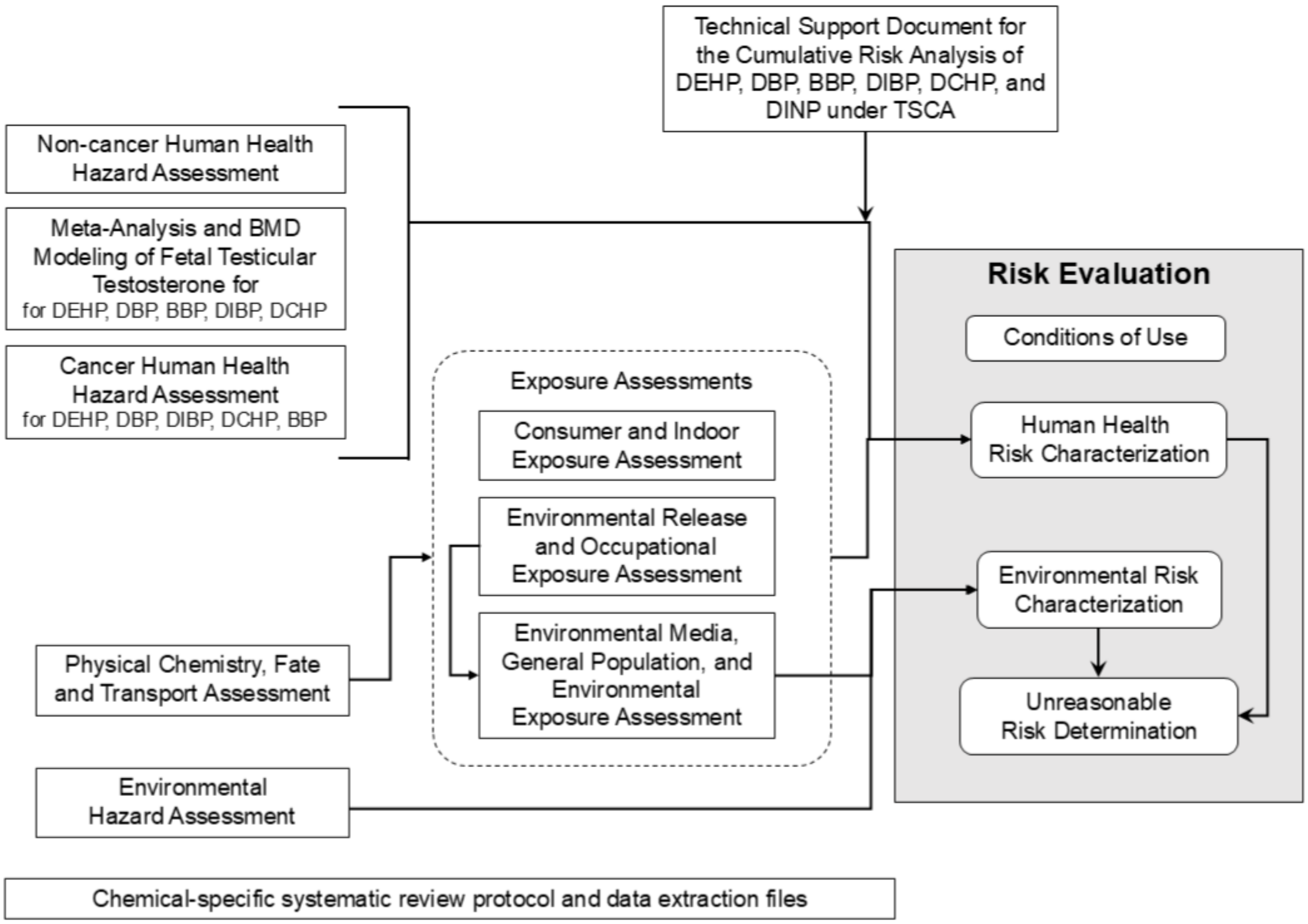

Figure 1-2. Risk Evaluation Document Summary Map

1.1.1 Life Cycle and Production Volume

The LCD shown in Figure 1-3 depicts the COUs that are within the scope of the risk evaluation during various life cycle stages, including manufacturing, processing, distribution, use (industrial, commercial, consumer), and disposal. The LCD has been updated since its inclusion in the final scope document, with consolidated and/or expanded processing and use steps. A complete list of updates and descriptions of the updates made to COUs for DIBP from the final scope document to this risk evaluation is provided in Appendix D. Information in the LCD is grouped according to the Chemical Data Reporting (CDR) processing codes and use categories (including functional use codes for industrial uses and product categories for industrial and commercial uses). The CDR rule under TSCA section 8(a) (see 40 CFR part 711) requires certain U.S. manufacturers (including importers) to provide EPA with information on the chemicals they manufacture or import into the United States.

EPA included descriptions of the industrial, commercial, and consumer use categories identified from the 2020 CDR in the LCD (U.S. EPA, 2020a). The descriptions provide a brief overview of the use category; the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) contains more detailed descriptions (*e.g.*, process descriptions, worker activities, process flow diagrams, equipment illustrations) for each manufacturing, processing, use, and disposal category.

Based on the 2020 CDR data, the U.S. production volume for DIBP was 407,303 lb in 2019, 403,833 lb in 2018, 384,591 lb in 2017, and 440,833 lb in 2016, as reported by the singular site Lanxess Corporation in Pittsburgh, Pennsylvania. For the 2016 and 2020 CDR cycle, data collected per chemical included the company name, volume of each chemical manufactured/imported, and information on whether the chemical is used in the commercial, industrial, and/or consumer sector(s). Review of preliminary 2024 CDR data shows that total production volumes for the years 2020 to 2023 are similar to the previously reported range from the 2020 CDR dataset.

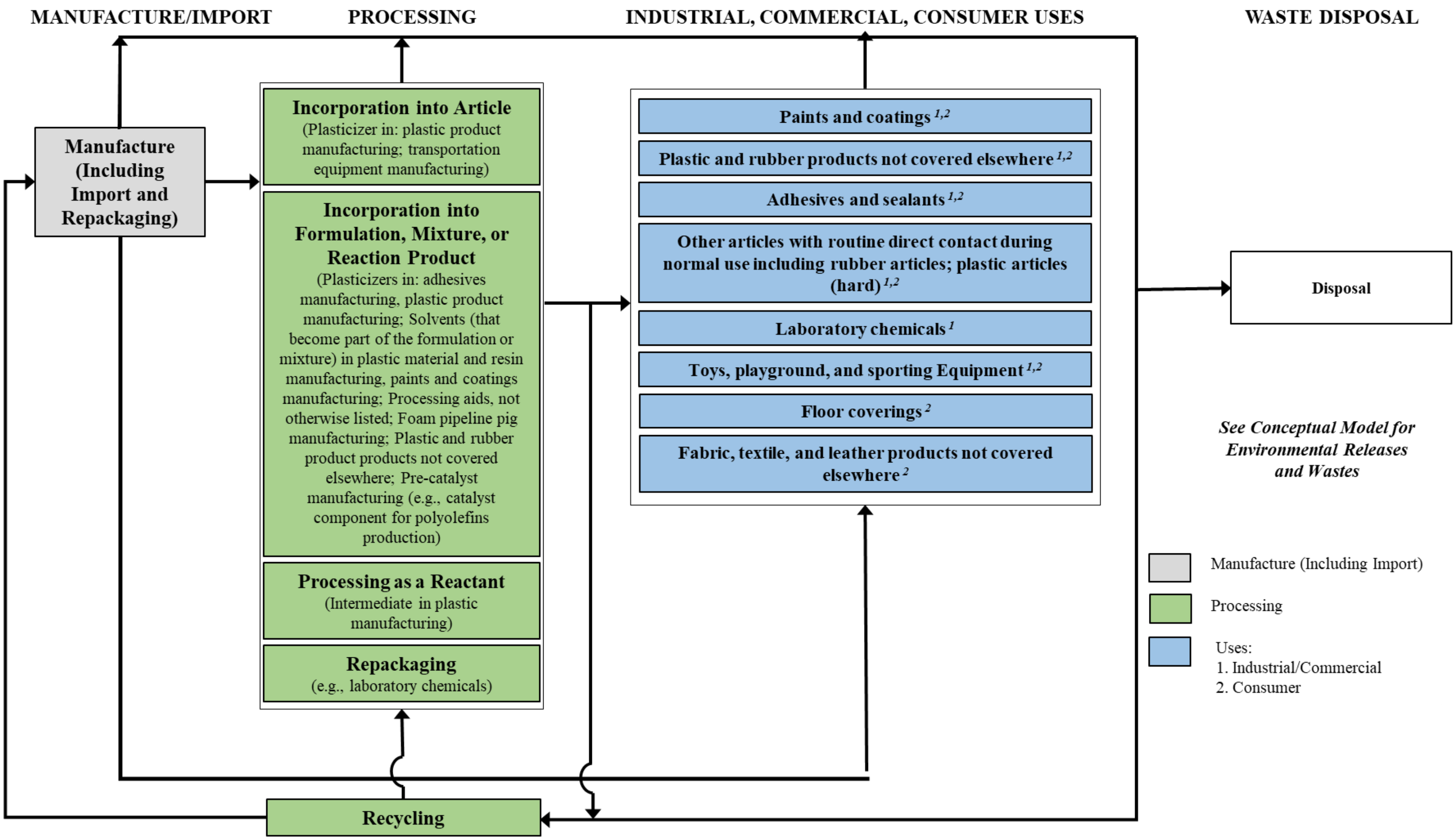

Figure 1-3. DIBP Life Cycle Diagram

See Table 1-1 for categories and subcategories of COUs. Activities related to distribution will be considered throughout the DIBP life cycle, as well as qualitatively through a single distribution scenario.

1.1.2 Conditions of Use Included in the Risk Evaluation

The final scope document (U.S. EPA, 2020c) identified and described the life cycle stages, categories, and subcategories that comprise COUs that EPA planned to consider in the risk evaluation. All COUs for DIBP included in this risk evaluation are reflected in the LCD (see Figure 1-3) and conceptual models (Section 1.1.2.1). Table 1-1 below lists all COUs for DIBP.

In this risk evaluation, EPA made updates to the COUs listed in the final scope document (U.S. EPA, 2020c). A complete list of updates and explanations of the updates made to COUs for DIBP from the final scope document to this risk evaluation is provided in Appendix D.

Table 1-1. Categories and Subcategories of Use in the Risk Evaluation for DIBP

Life Cycle Stage[a]	Category[b]	Subcategory[c]	Reference(s)
Manufacturing	Domestic manufacturing	Domestic manufacturing	U.S. EPA (2020a)
	Import	Import	U.S. EPA (2019)
Processing	Incorporation into article	Plasticizers (plastic product manufacturing; transportation equipment manufacturing)	U.S. EPA (2019); EPA-HQ-OPPT-2019-0131-0022; EPA-HQ-OPPT-2018-0434-0014; EPA-HQ-OPPT-2018-0434-0007
	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers (adhesive manufacturing; plastic product manufacturing)	U.S. EPA (2019); EPA-HQ-OPPT-2018-0434-0014; EPA-HQ-OPPT-2018-0434-0007
	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing; paint and coating manufacturing)	(Aceto US LLC, 2022; LANXESS, 2021a; U.S. EPA, 2019a; LANXESS, 2015)
	Processing – incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed	(LANXESS, 2021a)
	Processing – incorporation into formulation, mixture, or reaction product	Foam pipeline pig manufacturing	(LANXESS, 2021a)
	Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	(U.S. EPA, 2019a; LANXESS, 2015)
	Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	(W.R. Grace & Company, 2024a, 2022; LANXESS, 2021a)

Life Cycle Stage[a]	Category[b]	Subcategory[c]	Reference(s)
Processing	Processing – as a reactant	Intermediate (plastic manufacturing)	(W.R. Grace & Company, 2024a; LANXESS, 2021a)
	Repackaging (*e.g.*, laboratory chemicals)	Repackaging (*e.g.*, laboratory chemicals)	EPA-HQ-OPPT-2018-0434-0020
	Recycling	Recycling	EPA-HQ-OPPT-2018-0434-0014
Distribution in Commerce	Distribution in commerce	Distribution in commerce	N/A
Industrial Use	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	U.S. EPA (2019); EPA-HQ-OPPT-2019-0131-0022
	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	U.S. EPA (2019); Azon USA Inc (2015); Chemical Concepts Inc. (2014); Glue 360 Inc (2018); EPA-HQ-OPPT-2018-0434-0007; EPA-HQ-OPPT-2019-0131-0022
Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives	U.S. EPA (2019); Azon USA Inc (2015); Chemical Concepts Inc. (2014); Glue 360 Inc (2018); EPA-HQ-OPPT-2018-0434-0007; EPA-HQ-OPPT-2019-0131-0022
	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	U.S. EPA (2020a); EPA-HQ-OPPT-2019-0131-0022
	Laboratory chemicals	Laboratory chemicals	Sigma Aldrich (2024)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	(U.S. EPA, 2019e, 2016a)
Consumer Use	Floor coverings	Floor coverings	EPA-HQ-OPPT-2018-0434-0014; Danish EPA, 7265437); (Danish EPA, 10622421)
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	(U.S. EPA, 2019e, 2016a)

Life Cycle Stage[a]	Category[b]	Subcategory[c]	Reference(s)
Consumer Use	Paints and coatings	Paints and coatings	(Aceto US LLC, 2022; LANXESS, 2021a)
	Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	(Dow Chemical, 2013)
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	(U.S. EPA, 2019a, e, 2016a); EPA-HQ-OPPT-2019-0131-0022
	Adhesives and sealants	Adhesives and sealants	U.S. EPA (2019); Azon USA Inc (2015); Chemical Concepts Inc. (2014) Glue 360 Inc (2018); EPA-HQ-OPPT-2018-0434-0007; EPA-HQ-OPPT-2019-0131-0022; ITW Performance Polymers (2015)
Disposal	Disposal	Disposal	

[a] Life Cycle Stage Use Definitions (40 CFR 711.3)
- "Industrial Use" means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed.
- "Commercial Use" means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services.
- "Consumer Use" means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use.
- Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over "any manner or method of commercial use" under TSCA section 6(a)(5) to reach both.

[b] These categories of COU appear in the LCD, reflect CDR codes, and broadly represent COUs of DIBP in industrial and/or commercial settings.

[c] These subcategories represent more specific activities within the life cycle stage and category of the COUs of DIBP.

1.1.2.1 Conceptual Models

The conceptual model in Figure 1-4 presents the exposure pathways, exposure routes, and hazards to human populations from industrial and commercial activities and uses of DIBP. There is potential for exposure to workers and/or ONUs via inhalation and via dermal contact. The conceptual model also includes potential ONU dermal exposure to DIBP in mists and dusts deposited on surfaces. Figure 1-5 presents the conceptual model for consumer activities and uses, Figure 1-6 presents general population exposure pathways and hazards for environmental releases and wastes, and Figure 1-7 presents the conceptual model for ecological exposures and hazards from environmental releases and wastes.

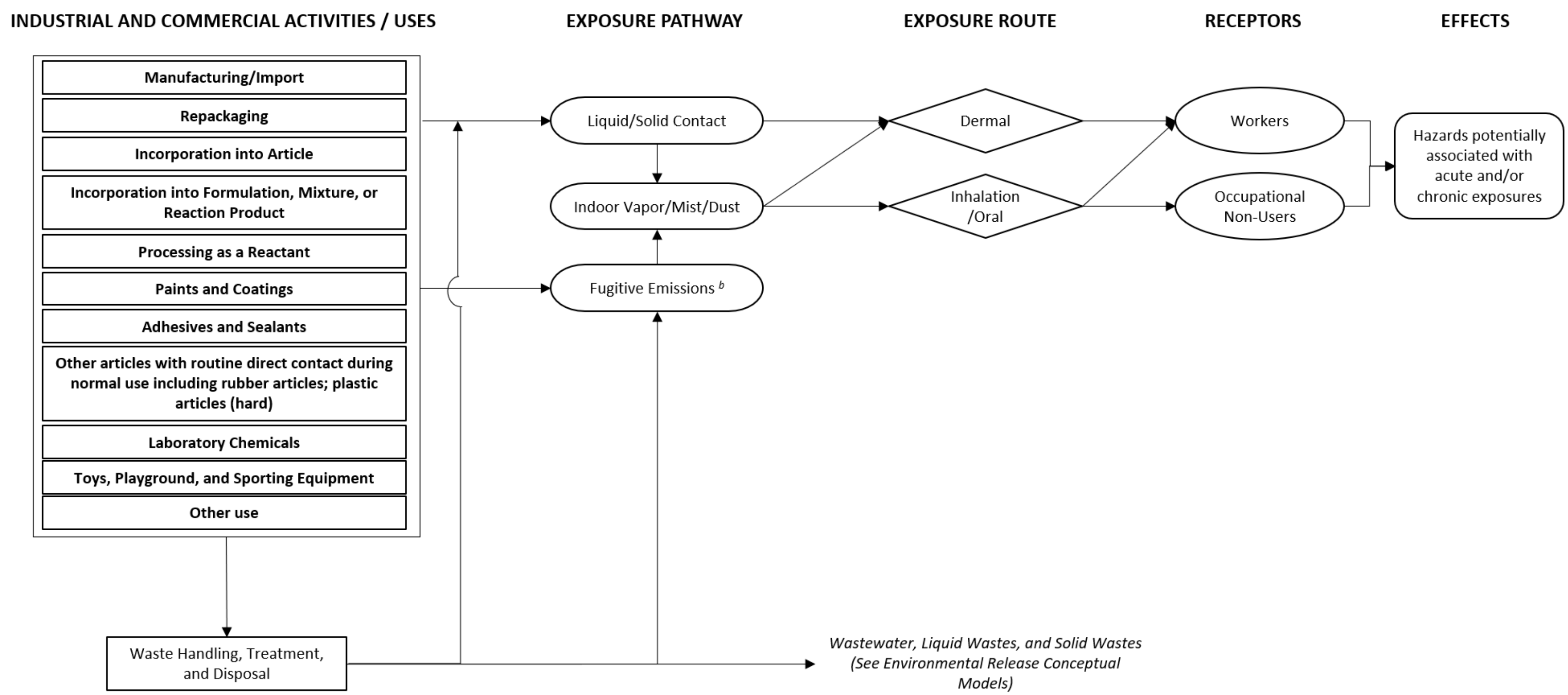

Figure 1-4. DIBP Conceptual Model for Industrial and Commercial Activities and Uses: Potential Exposures and Hazards

[a] Some products are used in both commercial and consumer applications. See Table 1-1 for categories and subcategories of COUs.

[b] Fugitive air emissions are those that are not stack emissions and include fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections and open-ended lines; evaporative losses from surface impoundment and spills; and releases from building ventilation systems.

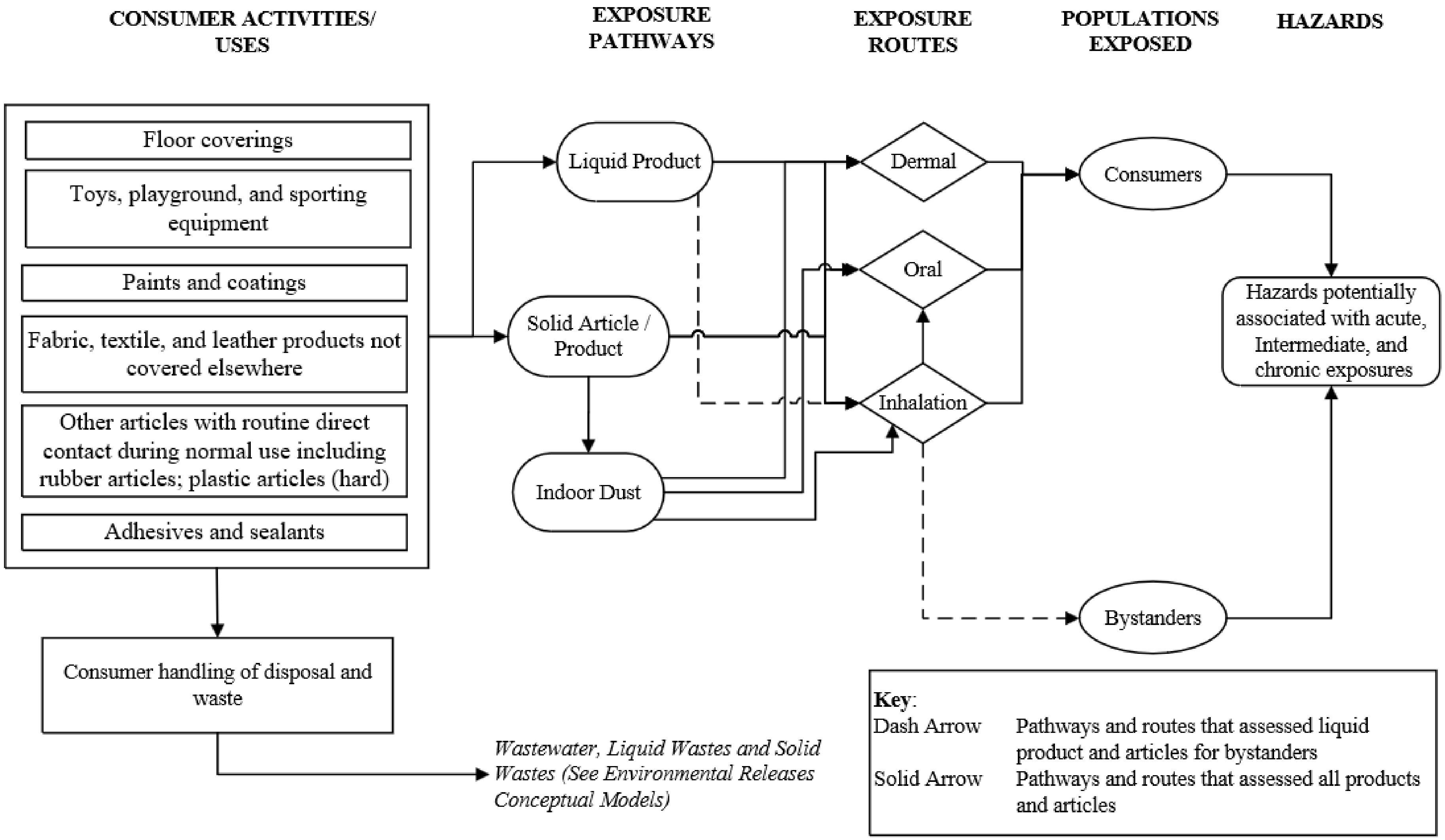

Figure 1-5. DIBP Conceptual Model for Consumer Activities and Uses: Potential Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from consumer activities and uses of DIBP.

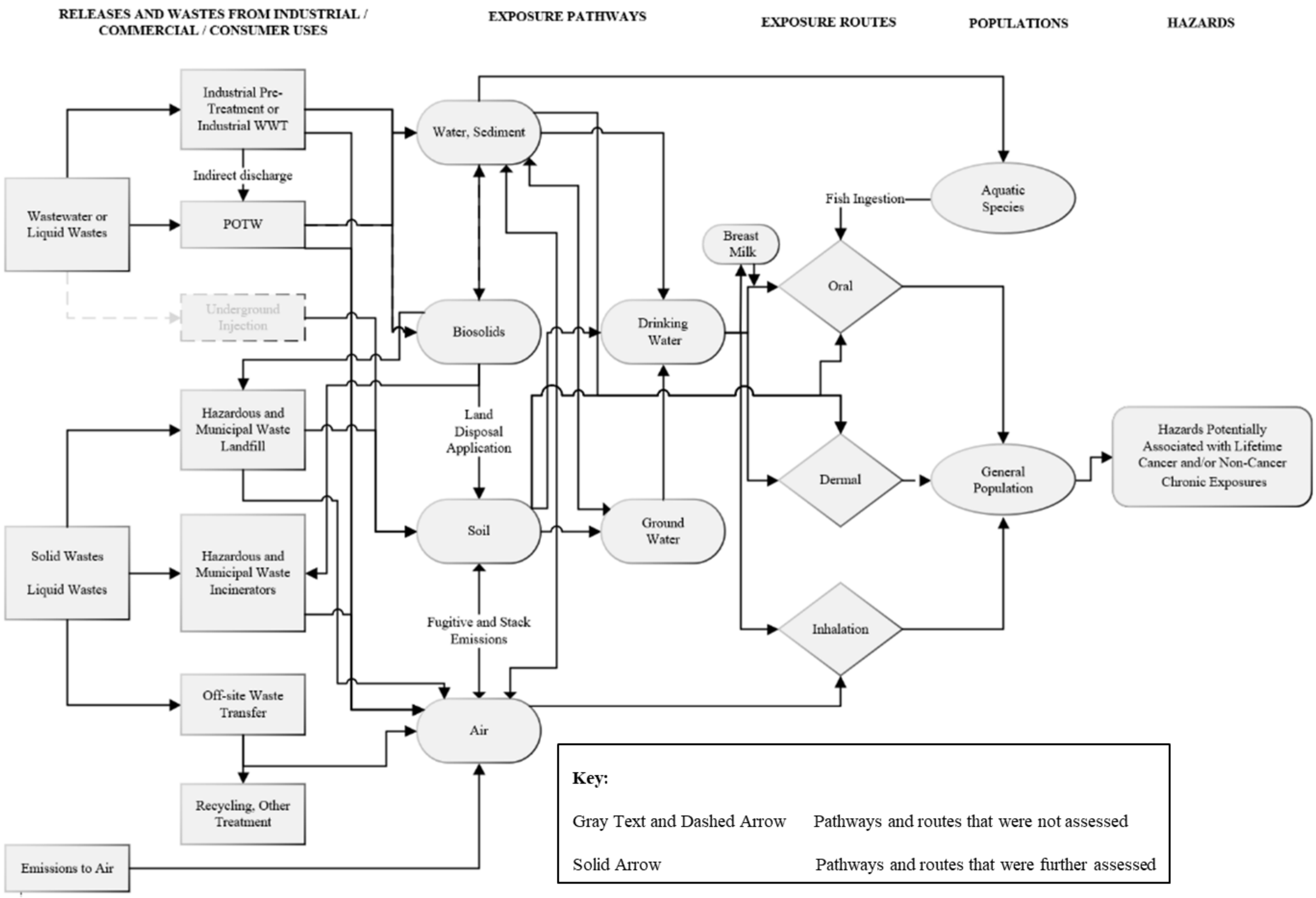

Figure 1-6. DIBP Conceptual Model for Environmental Releases and Wastes: General Population Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from releases and wastes from industrial, commercial, and/or consumer uses of DIBP.

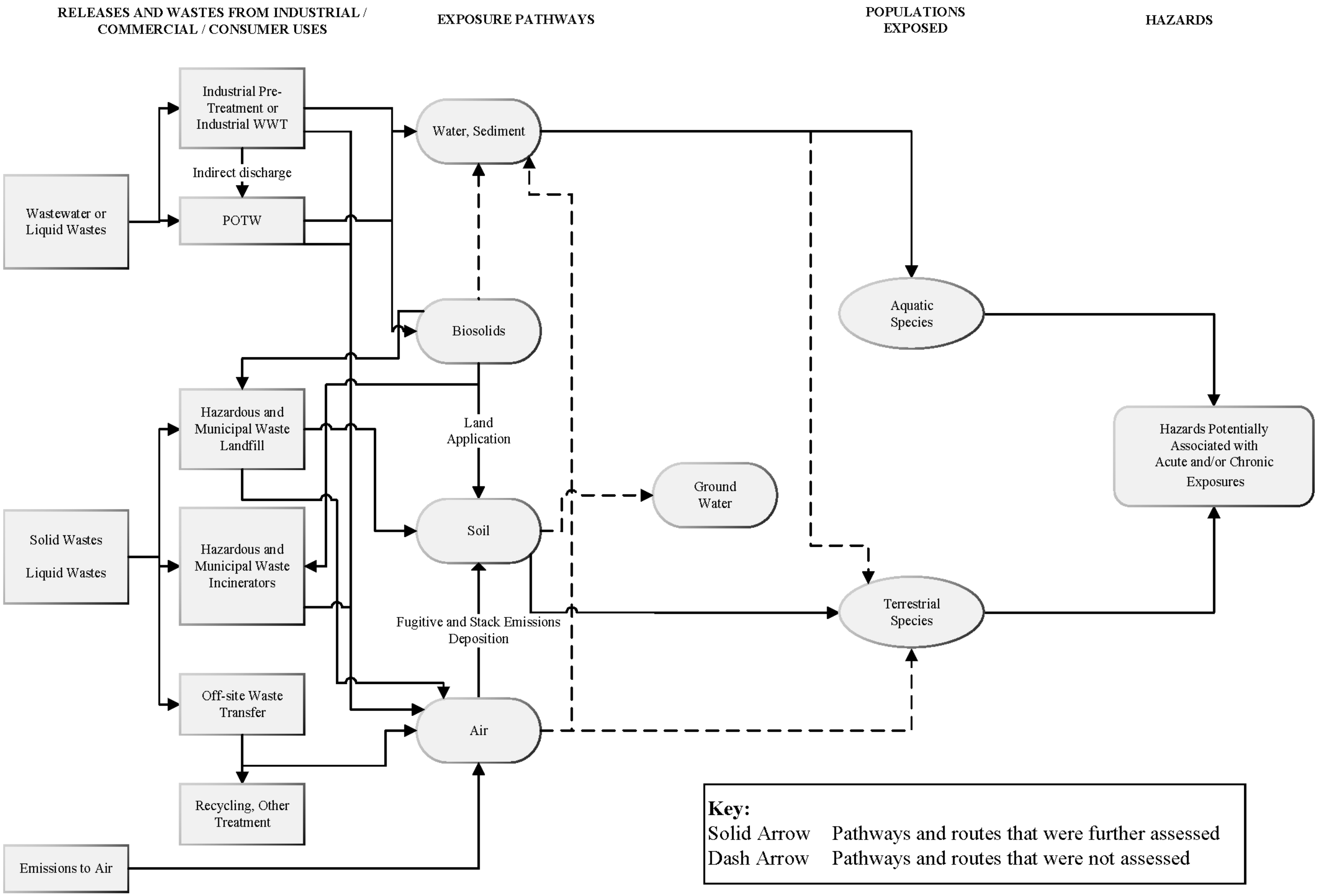

Figure 1-7. DIBP Conceptual Model for Environmental Releases and Wastes: Ecological Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to aquatic and terrestrial species from DIBP.

1.1.3 Populations and Durations of Exposure Assessed

Based on the conceptual models presented in Section 1.1.2.1, EPA evaluated risk to humans and the environment. Environmental risks were evaluated for acute and chronic exposure scenarios for aquatic and terrestrial species, as appropriate. Human health risks associated with exposure to DIBP were evaluated for acute, intermediate, and chronic exposure scenarios, as applicable based on reasonably available exposure and hazard data as well as the relevant populations for each. The following human populations were assessed:

- Workers, including average adults and females of reproductive age;
- ONUs, including average adults;
- Consumers, including infants (<1 year), toddlers (1–2 years), children (3–5 and 6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years);
- Bystanders to consumer uses, including infants (<1 year), toddlers (1–2 years), and children (3–5 and 6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years); and
- General population, including infants (<1 year), toddlers (1–5 years), children (6–10 years), youths (11–15 and 16–20 years), and adults (21+ years).

Note that the age groups for consumers, bystanders, and general population are different because each life stage used unique exposure factors (*e.g.*, mouthing, drinking water ingestion, fish consumption rates). These exposure factors are provided in EPA's *Exposure Factors Handbook: 2011 Edition* (U.S. EPA, 2011b).

Consistent with its *Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c), EPA is focusing its phthalate CRA on populations most relevant to the common hazard endpoint (*i.e.*, reduced fetal testicular testosterone)—specifically females of reproductive age and male infants and male children. This approach emphasizes a common health effect for sensitive subpopulations; however, additional health endpoints are identified for broader populations and described in the individual non-cancer human health hazard assessments for DIBP (U.S. EPA, 2025ad), DCHP (U.S. EPA, 2025ab), DEHP (U.S. EPA, 2025ac), DBP (U.S. EPA, 2025aa), BBP (U.S. EPA, 2025z), and DINP (U.S. EPA, 2025ae). Additionally, EPA is focusing its CRA on acute duration exposures. This is because—as described further in the *Technical Support Document for the CRA of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ap)—there is evidence that effects on the developing male reproductive system consistent with a disruption of androgen action can result from a single exposure during the critical window of development.

1.1.3.1 Potentially Exposed or Susceptible Subpopulations

TSCA section 6(b)(4)(A) requires that risk evaluations "determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other nonrisk factors, including an unreasonable risk to PESS identified as relevant to the risk evaluation by the Administrator, under the conditions of use." TSCA section 3(12) states that "the term 'potentially exposed or susceptible subpopulation' [PESS] means a group of individuals within the general population identified by the Administrator who, due to either greater susceptibility or greater exposure, may be at greater risk than the general population of adverse health effects from exposure to a chemical substance or mixture, such as infants, children, pregnant women, workers, or the elderly."

This risk evaluation considers PESS throughout the human health risk assessment (Section 4), including throughout the exposure assessment, hazard identification, and dose-response analysis supporting this assessment. EPA incorporated the following PESS into its assessment—females of reproductive age;

pregnant women, infants, children and adolescents; people who frequently use consumer products and/or articles containing high-concentrations of DIBP; people exposed to DIBP in the workplace; and people who may be in proximity to releasing facilities, including fenceline communities, and people whose diets include large amounts of fish (*i.e.*, subsistence fisher and Tribal populations). These subpopulations are PESS because some have greater exposure to DIBP per body weight (*e.g.*, infants, children, adolescents), while some experience aggregate or sentinel exposures. EPA also evaluated non-attributable exposures and cumulative risk to phthalates (*i.e.*, DEHP, DBP, BBP, DIBP, and DINP) using biomonitoring data from the U.S. Centers for Disease and Control and Prevention (CDC's) National Health and Nutrition Examination Survey (NHANES). This non-attributable cumulative risk from exposure to DEHP, DBP, BBP, DIBP, and DINP was taken into consideration as part of EPA's cumulative risk calculations for DIBP, presented below in Section 4.4 and around exposures to DIBP from both occupational and consumer COUs/OESs.

Section 4.3.5 summarizes how PESS were incorporated into the risk evaluation through consideration of potentially increased exposures and/or potentially increased biological susceptibility and summarizes additional sources of uncertainty related to consideration of PESS.

1.2 Organization of the Risk Evaluation

This risk evaluation for DIBP includes five additional major sections and several appendices, as listed below:

- Section 2 summarizes basic physical and chemical characteristics as well as the fate and transport of DIBP.
- Section 3 includes an overview of releases and concentrations of DIBP in the environment.
- Section 4 presents the human health risk assessment, including the exposure, hazard, and risk characterization based on the DIBP COUs. It includes a discussion of PESS based on both greater exposure and/or susceptibility as well as a description of aggregate and sentinel exposures. Section 4 also discusses assumptions and uncertainties and how they potentially impact the strength of the evidence of risk evaluation. Finally, Section 4 presents EPA's CRA of DIBP, DEHP, DBP, BBP, DCHP, and DINP (Section 4.4), as well as a comparison of the individual DIBP risk assessment and the CRA (Section 4.5).
- Section 5 provides a discussion and analysis of the environmental risk assessment, including the environmental exposure, hazard, and risk characterization based on the COUs for DIBP. It also discusses assumptions and uncertainties and how they impact EPA's overall confidence in risk estimates.
- Section 6 presents EPA's determination of whether the chemical presents an unreasonable risk to human health or the environment under the assessed COUs.
- Appendix A provides a list of key abbreviations and acronyms used throughout this risk evaluation.
- Appendix B provides a brief summary of the federal, state, and international regulatory history of DIBP.
- Appendix C incudes a list and citations for all TSDs and supplemental documents and files included in the risk evaluation for DIBP.
- Appendix D provides a summary of updates made to COUs for DIBP from the final scope document to this risk evaluation.
- Appendix E provides descriptions of the DIBP COUs evaluated by EPA.
- Appendix F provides the occupational exposure value for DIBP derived by EPA.

This risk evaluation describes analyses considering DIBP exposure under the COUs as the "individual assessment" or "single-chemical assessment" and analysis also considering background exposure to other phthalates[3] (*i.e.*, NHANES) as the "cumulative assessment." The risk evaluation includes each of the steps described below.

- The Risk Evaluation involves two sets of calculations for the single chemical analysis:
  Step 1. Single chemical, single route evaluation by COU.
    - Routes include dermal and inhalation for workers, and dermal, inhalation, and oral for consumers.
    - For example, evaluation of inhalation exposure to workers for the manufacturing COU.

  Step 2. Aggregate exposure and risk: Single chemical, multi-route evaluation by COU
    - Aggregate assessment is only conducted when the hazard assessment shows that the same hazard is observed from different routes (*i.e.*, dermal, inhalation and oral).
    - Aggregate risk for workers combines MOEs from dermal and inhalation routes by COU from Step 1.
    - Aggregate risk for consumers combines MOEs from dermal, inhalation, and oral routes by COU from Step 1.

- The Risk Evaluation also involves a third set of calculations:
  Step 3. "Cumulative" risk: Single chemical, multi-route evaluation by COU from Step 2 combined with NHANES background evaluation of BBP, DBP, DCHP, DEHP, and DINP
    - For phthalates, the multi-chemical aspect of the evaluation is derived from the addition of *background phthalate exposure* as estimated from NHANES biomonitoring data.
    - A detailed description of how this is done can found in the CRA TSD (U.S. EPA, 2025ap). Summary information is found in Section 4.4.2 of this risk evaluation.
    - The "cumulative" calculations start with the aggregate risk estimates from Step 2 for each phthalate by COU.
    - The NHANES background risk is combined with the aggregate risk estimates.
    - As such, the cumulative MOEs from each phthalate-COU scenario are 6.2 to 15.5 percent smaller than the aggregate MOE depending on the life stage. This is because the NHANES background risk was added.

[3] The six phthalates in the CRA are BBP, DBP, DCHP, DEHP, DIBP, and DINP.

2 CHEMISTRY AND FATE AND TRANSPORT OF DIBP

Physical and chemical properties determine the behavior and characteristics of a chemical that inform its COUs, environmental fate and transport, potential toxicity, exposure pathways, routes, and hazards. Environmental fate and transport includes environmental partitioning, accumulation, degradation, and transformation processes. Environmental transport is the movement of the chemical within and between environmental media such as air, water, soil, and sediment. Thus, understanding the environmental fate of DIBP informs the specific exposure pathways, and potential human and environmental exposed populations that EPA considered in this risk evaluation.

In general, under normal environmental conditions DIBP is a water-soluble clear viscous liquid that (1) is slightly volatile from water, (2) has low bioaccumulation potential in aquatic and terrestrial organisms, (3) has no apparent biomagnification across trophic levels in aquatic food webs, and (4) is considered readily biodegradable under most aquatic and terrestrial environmental conditions. Sections 2.1 and 2.2 summarize the physical and chemical properties, and environmental fate and transport of DIBP, respectively. EPA's *Physical Chemistry and Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag) provides further details.

2.1 Summary of Physical and Chemical Properties

EPA gathered and evaluated physical and chemical property data and information according to the process described in the *Systematic Review Protocol for DIBP* (U.S. EPA, 2025ao). EPA considered both measured and estimated physical and chemical property data/information summarized in Table 2-1, as applicable. Information on the full, extracted dataset is available in the *Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for DIBP* (U.S. EPA, 2025m).

Table 2-1. Physical and Chemical Properties of DIBP

Property	Selected Value(s)	Source	Data Quality Rating
Molecular formula	$C_{16}H_{22}O_4$		
Molecular weight	278.35 g/mol		
Physical form	Clear viscous liquid	CPSC (2011)	High
Melting point	−64 °C	NLM (2013)	High
Boiling point	296.5 °C	NLM (2013)	High
Density	1.049 g/cm^3	Rumble (2018a)	High
Vapor pressure	4.76E−05 mmHg	NLM (2013)	High
Vapor density	9.59	NCBI (2020)	High
Water solubility	6.2 mg/L	U.S. EPA (2019b)	High
Octanol:water partition coefficient (log K_{OW})	4.34	Ishak et al. (2016)	High
Octanol:air partition coefficient (log K_{OA})	9.47 (EPI Suite™)	U.S. EPA (2017a)	High
Henry's Law constant	1.83E−07 atm·m^3/mol at 25 °C	Elsevier (2019)	High
Flash point	185 °C	Rumble (2018b)	High
Autoflammability	432 °C	NLM (2013)	High
Viscosity	41 cP at 20 °C	NLM (2013)	High

2.2 Summary of Environmental Fate and Transport

Reasonably available environmental fate data—including biotic and abiotic biodegradation rates, removal during wastewater treatment, volatilization from water sources, and organic carbon:water partition coefficient (log K_{OC})—are parameters used in the current risk evaluation. In assessing the environmental fate and transport of DIBP, EPA considered the full range of results from the available highest quality data sources obtained during systematic review. Information on the full extracted dataset is available in the *Risk Evaluation for Diisobutyl Phthalate (DIBP) – Systematic Review Supplemental File: Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport* (U.S. EPA, 2025k). Other fate estimates were based on modeling results from EPI Suite™ (U.S. EPA, 2012a), a predictive tool for physical and chemical properties and environmental fate estimation. Information regarding the model inputs is available in the *Physical Chemistry and Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag).

EPA evaluated the reasonably available information to characterize the environmental fate and transport of DIBP; the key points of the fate assessment for DIBP (U.S. EPA, 2025ag) are summarized below and listed in Table 2-2.

Given the consistent results from numerous high-quality studies, there is robust evidence that DIBP:

- has chromophores that absorb in the visible range of the solar light spectrum and is expected to undergo direct photolysis;
- will partition to organic carbon and particulate matter in air;
- will biodegrade in aerobic surface water, soil, and wastewater treatment processes;
- does not biodegrade in anaerobic environments;
- will be removed after undergoing wastewater treatment and will sorb to sludge at high fractions, with a small fraction being present in effluent;
- is not bioaccumulative;
- is not expected to biodegrade under anoxic conditions and might have high persistence in anaerobic soils and sediments; and
- has a relatively short half-life in surface water ($t_{1/2}$= 5 days), which EPA assumed may be extended in surface waters proximal to points of continuous release where DIBP enters the environment at a rate at or above biodegradation.
- as a result of limited studies identified, there is moderate confidence that DIBP is expected to be partially removed in conventional drinking water treatment systems via sorption to suspended organic matter and filtering media; and
- will not significantly hydrolyze under standard environmental conditions, but hydrolysis rate was seen to increase with increasing pH and temperature in deep-landfill environments.

Findings with a robust weight of evidence supporting them had one or more high-quality studies that were largely in agreement with each other. Findings that were said to have a moderate weight of evidence were based on a mix of high- and medium-quality studies that were largely in agreement but varied in sample size and consistency of findings.

Table 2-2. Summary of Environmental Fate Information for DIBP

Parameter	Value	Source(s)	Data Quality Ranking
Octanol:water (Log K_{OW})	4.34	Ishak et al. (2016)	High
Organic carbon:water (Log K_{OC})	2.67 (average of 2.50, 2.56, and 2.86)	He et al. (2019)	High
Adsorption coefficient (Log K_d)	2.65−3.10 (suspended particulate matter/water) 3.97−4.30 (sediment/water)	Li et al. (2017)	High
Octanol:air (Log K_{OA})	9.47 (EPI Suite estimate)	U.S. EPA (2017a)	High
Air:water (Log K_{AW})	−4.3 (estimated) and −4.27 (estimated)	Lu (2009) Cousins and Mackay (2000)	High
Aerobic ready biodegradation in water	42–98% in 28 days	EC/HC (2015); BASF Aktiengesellschaft (2007a, 2007b)	High
Aerobic biodegradation in sediment (DBP as analog)	$t_{1/2}$ = 2.9 days in natural river sediment collected from the Zhonggang, Keya, Erren, Gaoping, Donggang, and Danshui Rivers, Taiwan	Yuan et al. (2002)	High
Anaerobic biodegradation in sediment	0–30% after 56 days in marine sediment	NCBI (2020)	Medium
Aerobic biodegradation in soil (DBP as analog)	88.1–97.2% after 200 days in Chalmers slit loam, Plainfield sand, and Fincastle silt loam soils	Inman et al. (1984)	High
Hydrolysis	Rate constant at pH 10–12: 1.4E−03 M^{-1} s^{-1} $t_{1/2}$ at pH 7: 5.3 years at 25 °C (estimated); $t_{1/2}$ at pH 8: 195 days at 25 °C (estimated)	Wolfe et al. (1980) U.S. EPA (2017a)	High
Photolysis	Direct: expected to be susceptible to direct photolysis by sunlight; contains chromophores that absorb at wavelengths >290 nm Indirect: $t_{1/2}$ = 1.15 days (27.6 hours) (estimated; based on a 12-hour day with 1.5E06 ·OH/cm^3 and ·OH rate constant of 9.26E−12 ·OH/cm^3 and ·OH cm^3/molecule-sec)	NLM (2013) U.S. EPA (2017a)	High
Environmental degradation half-lives (selected values for modeling)	27.6 hours (air) 5 days (water) 10 days (soil) 45 days (sediment)	U.S. EPA (2017a)	High
Wastewater treatment plant (WWTP) removal	65–95%	U.S. EPA (1982) Tran et al. (2014)	High

Parameter	Value	Source(s)	Data Quality Ranking
Aquatic bioconcentration factor (BCF)	30.2 L/kg wet weight (upper trophic Arnot-Gobas estimation)	U.S. EPA (2017a)	High
Aquatic bioaccumulation factor (BAF)	30.2 L/kg wet weight (upper trophic Arnot-Gobas estimation)	U.S. EPA (2017a)	High
Aquatic food web magnification factor (FWMF)	0.81 (experimental; 18 marine species)	Mackintosh et al. (2004)	High
Terrestrial bioconcentration factor (BCF)	2.23 at 0.13 mg/kg in onion, celery, pepper, tomato, bitter gourd, eggplant, and long podded cowpea	Li et al. (2016)	High
Terrestrial biota-sediment accumulation factor (BSAF) (DBP as analog)	0.18–0.46 (*Eisenia fetida*)	Hu et al. (2005) Ji and Deng (2016)	High

3 RELEASES AND CONCENTRATIONS OF DIBP IN THE ENVIRONMENT

EPA estimated releases and concentrations of DIBP in the environment. Section 3.1 describes the approach and methodology for estimating releases. Estimates of environmental releases are presented in Section 3.2, whereas Section 3.3 presents the approach, methodology, and summary of concentrations of DIBP in the environment.

3.1 Approach and Methodology

This section provides an overview of the approach and methodology for assessing releases of DIBP to the environment from industrial, commercial, and consumer uses. Specifically, Sections 3.1.1 through 3.1.2 describe the approach and methodology for estimating releases to the environment from industrial and commercial uses, and Section 3.1.3 describes the approach and methodology for assessing down-the-drain releases from consumer uses.

3.1.1 Manufacturing, Processing, Industrial, and Commercial Use

This subsection describes the relationship of COU and OES and the use of DIBP in the case of each OES. Specifically, Section 3.1.1.1 provides a crosswalk of COUs to OESs, and Section 0 provides descriptions for the use of DIBP within each OES.

3.1.1.1 Crosswalk of Conditions of Use to Occupational Exposure Scenarios

EPA developed OESs to assess the environmental releases of, and occupational exposures to DIBP that result from the COUs listed in Table 3-1. An OES is associated with one or more DIBP COUs but in some cases multiple OESs were developed to assess a single DIBP COU because of the variability of the releases of and occupational exposures to DIBP that are expected to result from this COU. Table 3-1 and Table 3-2 provide a crosswalk between COUs and OESs.

For the purpose of this risk evaluation, distribution in commerce is the transportation of DIBP containing products and articles between sites at which DIBP manufacturing, processing, and use occurs or the transportation of DIBP-containing wastes for recycling or disposal. EPA expects all of the above-mentioned materials to be transported in closed system or otherwise to be transported in a form (*e.g.*, articles containing DIBP) such that there is negligible potential for releases except during an incident. Therefore, the Agency did not assess environmental releases of and occupational exposure to DIBP as a result of distribution in commerce.

Table 3-1. Crosswalk of COUs to Assessed OES

COU			OES[d]
Life Cycle Stage[a]	**Category[b]**	**Subcategory[c]**	
Manufacturing	Domestic manufacturing	Domestic manufacturing	Manufacturing
Manufacturing	Import	Import	Repackaging into large and small containers
Processing	Repackaging (*e.g.*, laboratory chemicals)	Repackaging (*e.g.*, laboratory chemicals)	Repackaging into large and small containers
	Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastics converting
	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants
		Plasticizers in: – plastic product manufacturing	Plastic compounding
		Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Plastic compounding
			Incorporation into paints and coatings
		Processing aids, not otherwise listed	Plastic compounding
		Plastic and rubber products not covered elsewhere	Rubber manufacturing – rubber compounding and rubber converting
		Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst
		Foam pipeline pig manufacturing	Rubber manufacturing
	Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing
	Recycling	Recycling	Recycling
Distribution in Commerce	Distribution in commerce	Distribution in commerce	Distribution in commerce
Industrial Use	Paints and coatings	Paints and coatings	Application of paints and coatings
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication of final product from articles

COU			OES[d]
Life Cycle Stage[a]	**Category[b]**	**Subcategory[c]**	
	Adhesives and sealants	Adhesives and sealants: – two-component glues and adhesives: – transportation equipment manufacturing	Application of adhesives and sealants – spray and non-spray
Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives	Application of adhesives and sealants – spray and non-spray
	Paints and coatings	Paints and coatings	Application of paints and coatings
	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication of final product from articles
	Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals – solids and liquids
	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Fabrication of final product from articles
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal

[a] Life Cycle Stage Use Definitions (40 CFR 711.3)

- “Industrial Use” means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed.
- “Commercial Use” means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services.
- “Consumer Use” means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use.
- Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over “any manner or method of commercial use” under TSCA section 6(a)(5) to reach both.

[b] These categories of COU appear in the LCD, reflect Chemical Data Reporting (CDR) codes, and broadly represent COUs of DIBP in industrial and/or commercial settings.

[c] These subcategories represent more specific activities within the life cycle stage and category of the COU of DIBP.

[d] An OES is based on a set of facts, assumptions, and inferences that describe how releases and exposures take place within an occupational COU. The occurrence of releases/exposures may be similar across multiple COU (multiple COUs mapped to single OES), or there may be several ways in which releases/exposures take place for a given COU (single COU mapped to multiple OESs).

Table 3-2. Crosswalk of Assessed OES to COUs

OES[a]	COU		
	Life Cycle Stage[b]	**Category[c]**	**Subcategory[d]**
Manufacturing	Manufacturing	Domestic manufacturing	Domestic manufacturing
Plastic compounding	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing
	Processing	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings
	Processing	Processing – incorporation into formulation, mixture, or reaction product	Processing aids, not otherwise listed
Plastics converting	Processing	Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing
Use as a catalyst – formulation into pre-catalyst	Processing	Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)
Use as a catalyst – intermediate in polypropylene manufacturing	Processing	Processing as a reactant	Intermediate in plastic manufacturing
Repackaging into large and small containers	Manufacturing	Import	Import
	Processing	Repackaging (*e.g.*, laboratory chemicals)	Repackaging (*e.g.*, laboratory chemicals)
Use of laboratory chemicals – solids and liquids	Commercial Use	Laboratory chemicals	Laboratory chemicals
Incorporation into adhesives and sealants	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing
Application of adhesives and sealants – spray and non-spray	Industrial Use	Adhesives and sealants	Adhesives and sealants: – two-component glues and adhesives: – transportation equipment manufacturing
	Commercial Use	Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives

OES[a]	COU		
	Life Cycle Stage[b]	**Category[c]**	**Subcategory[d]**
Incorporation into paints and coatings	Processing	Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings
Application of paints and coatings	Industrial Use	Paints and coatings	Paints and coatings
	Commercial Use	Paints and coatings	Paints and coatings
Rubber manufacturing – rubber compounding and rubber converting	Processing	Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere
	Processing	Processing – incorporation into formulation, mixture, or reaction product	Foam pipeline pig manufacturing
Recycling	Processing	Recycling	Recycling
Distribution in commerce	Distribution in Commerce	Distribution in commerce	Distribution in commerce
Fabrication of final product from articles	Industrial Use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
	Commercial Use	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
	Commercial Use	Toys, playground, and sporting equipment	Toys, playground, and sporting equipment
Waste handling, treatment, and disposal	Disposal	Disposal	Disposal

[a] An OES is based on a set of facts, assumptions, and inferences that describe how releases and exposures take place within an occupational COU. The occurrence of releases/exposures may be similar across multiple COUs (multiple COUs mapped to single OES), or there may be several ways in which releases/exposures take place for a given COU (single COU mapped to multiple OESs).

[b] Life Cycle Stage Use Definitions (40 CFR 711.3)

- "Industrial Use" means use at a site at which 1 or more chemicals or mixtures are manufactured (including imported) or processed.
- "Commercial Use" means the use of a chemical or a mixture containing a chemical (including as part of an article) in a commercial enterprise providing saleable goods or services.
- "Consumer Use" means the use of a chemical or a mixture containing a chemical (including as part of an article, such as furniture or clothing) when sold to or made available to consumers for their use.
- Although EPA has identified both industrial and commercial uses here for purposes of distinguishing scenarios in this document, the Agency interprets the authority over "any manner or method of commercial use" under TSCA section 6(a)(5) to reach both.

[c] These categories of COUs appear in the life cycle diagram, reflect CDR codes, and broadly represent COUs of DIBP in industrial and/or commercial settings.

[d] These subcategories represent more specific activities within the life cycle stage and category of the COUs of DIBP.

3.1.1.2 Description of DIBP Use for Each OES

A brief description of the process and/or of the use of DIBP in the case of each OES is presented in Table 3-3.

Table 3-3. Description of the Use of DIBP for Each OES

OES	Use of DIBP
Manufacturing	DIBP may be produced through the catalytic esterification of phthalic anhydride with isobutanol in a closed system. Typical manufacturing operations consist of esterification followed by a purification process using vacuum distillation or activated charcoal.
Repackaging into large and small containers	DIBP is imported domestically for use and/or may be repackaged before shipment to formulation sites.
Incorporation into adhesives and sealants	DIBP is a plasticizer in adhesives and sealants for industrial and commercial use, including grouts and industrial adhesives.
Incorporation into paints and coatings	DIBP is an additive in paints and coatings for industrial and commercial use, including paints and colorants.
Use as a catalyst	DIBP is used as an electron donor in pre-catalyst formulations that are ultimately used as a catalyst intermediate in polypropylene (PP) manufacturing.
Application of paints and coatings	Industrial and commercial sites use DIBP-containing paints and coatings that are roll, brush, trowel, and spray applied.
Application of adhesives and sealants	DIBP is used in a variety of adhesive and sealant products including anchoring adhesive, grouts, and seam adhesives. Application methods include caulk gun, syringe, roll, bead, dip and spray application.
Use of laboratory chemicals	DIBP is used for laboratory analyses in both solid and liquid forms.
Fabrication of final product from articles	DIBP is found in a wide array of different final articles not found in other OESs, including rifle cartridges, glitter boards, and polyurethane foams.
Plastic compounding	DIBP is used as a plasticizer in plastic resins product manufacturing.
Plastics converting	DIBP is used as a plasticizer in plastic resins product manufacturing.
Rubber manufacturing	DIBP is used in production of polymers such as rubber and polyurethane foam pipeline pigs.
Recycling	A fraction of plastics is recycled either in-house or at recycling facilities for continuous compounding of new plastic material.
Waste handling, treatment, and disposal	Upon manufacture or use of DIBP-containing products, residual chemical is disposed and released to air, wastewater, or disposal facilities.

3.1.2 Daily Release Estimation

EPA assessed releases of DIBP to the environment or to disposal in accordance with Emission Scenario Documents (ESDs) and Generic Scenarios (GSs) because reported release data (*e.g.*, DIBP TRI data) are lacking. This approach involves the assessment of releases of a chemical substance from the generic site of an OES. Specifically, EPA assesses the rate of release of a chemical substance from each of various sources of release that are located at the generic site. The Agency also assesses the environmental medium in which the release occurs or the disposal method of the release in the case of each of the release sources in accordance with an ESD, GS, or EPA model. There are multiple environmental media of release or disposal methods in the case of releases from some release sources because of uncertainty about the media of release or disposal methods at the actual sites that are associated with the COU and the OES.

The assessment of releases of a chemical substance in accordance with ESDs and GSs involves the calculation of a daily site throughput or batch volume of the chemical substance and the calculation of the daily rate of release of the chemical substance from this daily site throughput or batch volume using EPA models. EPA estimated a daily DIBP site throughput in the case of each OES and then calculated the daily rates of DIBP releases from this estimated daily DIBP site throughput using EPA models. For the most part, the Agency estimated the daily DIBP site throughput of an OES by calculating this parameter from the following parameters: (1) the DIBP production volume associated with the OES; (2) the number of DIBP manufacturing, processing, or use sites associated with the OES; and (3) the number of days of operation of the generic site of the OES. Alternatively, the Agency estimated the daily DIBP site throughput of an OES from an estimate of the daily site throughput of the product that contains DIBP (*e.g.,* coatings products) and concentrations of DIBP in this product. When available, EPA utilized data reported under CDR to determine production volumes and safety data sheets (SDSs) to determine product concentrations. Table 3-4 contains the Agency's estimates of production volume and number of sites in the case of each OES, and brief summaries of the rationale for these estimates. This table also contains information about daily site throughput of the product that contains DIBP and concentration of DIBP in this product in the case of relevant OESs.

The number of days per year during which DIBP is released to the environment from sites at which DIBP is manufactured, processed, used or disposed of is unknown to EPA. Accordingly, the Agency estimated the number of release days per year per site in the case of each OES. To estimate this parameter, EPA assumed that DIBP releases from all of the sources of release at a generic site with few exceptions occur during each day of operations involving DIBP at the site and, as stated above, EPA estimated the number of such days in the case of each OES. As presented in Table 3-5, the Agency estimated the number of operating days as a range of values that is derived from literature that is mainly GSs or ESDs or as 250 days/year if such information is lacking. The exceptions referenced above are releases from equipment and container cleaning in the case of a few of the OESs; the Agency estimated the number of release days in these cases as 1 or 4 days per year in the case of equipment cleaning and as the number of unloaded containers in the case of container cleaning.

The DIBP production volume associated with an OES and the number of DIBP manufacturing, processing or use sites associated with an OES that EPA estimated are uncertain and the Agency estimated these parameters as probability distributions if data were available to do that. For the generic site of an OES, in some cases EPA estimated the number of days of operation at the site, and/or the daily site throughput of the product that contains DIBP (*e.g.,* coatings products) and concentrations of DIBP in this product as probability distributions to incorporate the expected variability of these parameters in the case of actual sites although these probability distributions are uncertain. The models that EPA used to assess the daily rates of DIBP releases include model parameters that the Agency also estimated as probability distributions in some cases because of uncertainty about the values of these parameters in the case of actual sites. EPA used Monte Carlo simulation to calculate the daily rates of DIBP releases to incorporate values of parameters that were estimated as probability distributions into the calculations of these release rates, and these release rates were calculated as probability distributions. A comprehensive description of EPA methodology for the assessment of the daily rates of DIBP releases is given in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w).

Table 3-4. Estimated Production Volume and Number of Sites for Each OES for DIBP[a]

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
Manufacturing	184,750	1	The 2020 DIBP CDR information (U.S. EPA, 2020a) consists of information about LANXESS Corporation only. According to this information, this company manufactured 184,750 kg of DIBP in 2019 at a single site in Greensboro, NC.	(U.S. EPA, 2020a)
Plastic compounding	184,750	1–9	The DIBP manufactured by LANXESS Corporation was processed to manufacture plastic products and this processing occurred at <10 sites (U.S. EPA, 2020a). Therefore, the production volume of this OES equals the manufacturing production volume, and the number of sites was assessed as a uniform distribution with lower and upper bounds of 1 and 9 sites, respectively.	
Plastics converting	184,750	6–70	Plastic converting occurs downstream of plastic compounding and therefore the production volumes of these 2 OESs are equal. EPA calculated the number of plastic converting sites in accordance with the Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f) as the ratio of the DIBP production volume that is used in plastic converting annually to the annual DIBP site throughput at a plastic converting site on average. Furthermore, this DIBP site throughput was calculated from estimates of the following 3 parameters: (1) the total of the average annual site throughputs of various plastic additives, (2) the concentration of DIBP in plastic and (3) the total of the average concentrations of various plastic additives in plastics. Estimated values of the first and third of these 3 parameters are given in the Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f). The concentration of DIBP in plastics is equal to 0.65–7.4 weight % (Danish EPA, 2011) and therefore EPA estimated the concentration of DIBP in plastics to be equal to this range of values. This resulted in a range of values of number of sites equal to 6–70 sites and EPA assumed a uniform distribution of number of sites with this range of values.	(U.S. EPA, 2021f) (Danish EPA, 2011)
Use as a catalyst – formulation into pre-catalyst	19,125–76,500	2–5	EPA assumed all polypropylene produced in the United States is produced using DIBP-containing catalyst and calculated the production volume of this OES as a range of values from the U.S. production volume of polypropylene in 2019, which is 7.65 million tons (Jaganmohan, 2020), and the concentration of DIBP in polypropylene, which is 2.5–10 ppm (W.R. Grace & Company, 2022). The Agency then assumed a uniform distribution of the values of the range of DIBP production volume of this OES. The Agency estimated the number of sites as a uniform distribution with a range of values of 2–5 sites based on information about the number of catalyst	(Jaganmohan, 2020) (W.R. Grace & Company, 2022)

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
			manufacturing sites of the following companies: W.R. Grace and Company and LyondellBasell (Lyondell Chemical Co., 2022; W.R. Grace & Company, 2022).	(Lyondell Chemical Co., 2022) (W.R. Grace & Company, 2024b)
Use as a catalyst – intermediate in polypropylene manufacturing	19,125–76,500	19–38	The production volume of this OES equals to the production volume of the OES of the Use as a catalyst – formulation into pre-catalyst because products of that OES are feed material in the case of this OES. EPA calculated the number of sites of this OES (*i.e.*, the number of polypropylene manufacturing sites at which DIBP is used) as the ratio of the annual U.S. polypropylene production volume in 2019, which is 7.65 million tons (Jaganmohan, 2020), and the annual throughput of polypropylene at polypropylene manufacturing sites, which is equal to 200–400 million kg/site-year (Lyondell Chemical Co., 2022). The Agency assumed a uniform distribution of values of the range of annual throughput of polypropylene at polypropylene manufacturing sites and calculated the number of sites of this OES as a probability distribution.	
Repackaging into large and small containers	45,359	1–355	EPA estimated the production volume of this OES to be equal to the upper threshold for CDR reporting, which is equal to 100,000 lb (45,359 kg). The Agency estimated the DIBP site throughput as a triangular distribution of 1 to 315,479 kg/site-year with a mode of 7,000 kg/site-year based on the Chemical Repackaging GS (U.S. EPA, 2022a). The Agency then calculated the number of repackaging sites as a probability distribution from the ratio of the production volume and the daily DIBP site throughput of this OES. Although the maximum number of sites is 355, the 99th percentile value of this parameter is equal to 10 sites.	(U.S. EPA, 2022a)
Use of laboratory chemicals	9,327	9–27,858	EPA estimated the production volume of this OES to be equal to 5% of the manufacturing production volume. EPA calculated the number of sites from an estimate of the daily DIBP site throughput in the case of laboratory liquid use, which EPA calculated from the Generic Scenario on Use of Laboratory Chemicals (U.S. EPA, 2023f). Although the maximum number of sites is 27,858, the 99th percentile value of this parameter is equal to 986 sites.	(U.S. EPA, 2023f)

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
Incorporation into adhesives and sealants	3,694	1	According to the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011), 6% of the DIBP production volume is used in non-polymer end use categories. Based on this, EPA conservatively assumed the production volume of DIBP that is used in the case of 4 certain COUs to be equal to 2% of the DIBP production volume that EPA assessed in the case of the manufacturing of DIBP. These 4 COUs are the following: adhesive manufacturing, paint and coating manufacturing, rubber manufacturing, and foam pipeline pig manufacturing. The annual production volume in the case of each of these COUs is 2% of 184,750 kg or 3,694 kg. EPA assessed one site because a single site, Sika Corp in Lyndhurst, NJ, reported the use of DIBP in adhesives manufacturing according to the 2016 CDR information (U.S. EPA, 2021a).	(Danish EPA, 2011) (U.S. EPA, 2021a)
Application of adhesives and sealants	3,694	1–129	The production volume of this OES equals to the production volume of the OES of incorporation into adhesives and sealants because products of that OES are feed material in the case of this OES. EPA calculated the daily DIBP site throughput of this OES as a probability distribution from estimates of the average daily site throughput of adhesive products (OECD, 2015b), the production volume of this OES, and the concentrations of DIBP in adhesive and sealant product as reported in SDSs of adhesive and sealant products that contain DIBP. This calculation is explained in Section 3.7 and Appendix D.8 of the *Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025w). Appendix E of this document contains the citations of the SDSs referenced above and the overall quality rating of these documents is high or medium. The Agency calculated the number of sites as the ratio of the production volume of the OES and the daily DIBP site throughput.	(OECD, 2015b)
Incorporation into paints and coatings	3,694	1–2	Refer to the rationale for the production volume of the OES of incorporation into adhesives and sealants for the rationale for the production volume of this OES. EPA's systematic review resulted in SDSs of paint products that contain DIBP but EPA did not infer a number of sites based on this information. Therefore, the Agency assumed the number of sites as a discrete distribution of 1–2 sites.	None
Application of paints and coatings	3,694	2–127	The production volume of this OES equals to the production volume of the OES of Incorporation into paints and coatings because products of that OES are feed material in the case of this OES. EPA calculated the daily DIBP site throughput of this OES as a probability distribution from estimates of the average daily site throughput of	(OECD, 2011b)

OES	Annual Production Volume (kg)	Number of Sites Reporting to CDR	Summary of the Estimation of Production Volume and Number of Sites	Reference(s)
			radiation curable coating products (OECD, 2011b), the production volume of this OES, and the concentrations of DIBP in paints and coatings product as reported in SDSs of paints and coatings products that contain DIBP. This calculation is explained in Section 3.6 and Appendix D.7 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). Appendix E of this document contains the citations of the SDSs referenced above and the overall quality rating of these documents is high or medium. The Agency calculated the number of sites as the ratio of the production volume of the OES and the daily DIBP site throughput.	
Rubber manufacturing	7,388	2	There are 2 COUs under this OES, and the production volume of each COU is estimated as 3,694 kg/yr. Therefore, the total production volume for the OES is estimated as 7,388 kg/yr. Refer to the rationale for the production volume of the OES of incorporation into adhesives and sealants for the rationale for the production volume of this OES. Because there are two sites known for this OES, the site throughput for each site is estimated as 3,694 kg/site-yr. The Agency determined the concentration of DIBP in rubber products as the range of values of 0.1–20% based on the concentration of plasticizers in rubber and similar polymer materials, which is 1–5% (LANXESS, 2021b; U.S. EPA, 2021e) and the concentration of rubber additives in rubber, which is 10–20% (OECD, 2004) (all concentrations are weight percent.) The calculated number of sites is 0.002–0.04 and therefore the Agency assumed a single site.	(U.S. EPA, 2021e) (OECD, 2004) (LANXESS, 2021b)
Recycling	5,543	59	According to Milbrandt (2022), 3% of plastic products are recycled and therefore EPA estimated the production volume of this OES to be equal to 3% of the production volume of the plastic converting OES. The Agency assessed 59 recycling sites because there are 59 plastic recyclers as of January 22, 2024 (ENF, 2024).	Milbrandt (2022) (ENF, 2024)
Fabrication of final product from articles	N/A		EPA did not assess these OESs quantitatively.	N/A
Waste handling, treatment, and disposal				

[a] The estimation of production volume and number of sites is documented in detail in Section 3 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w).

Table 3-5. Estimated Number of Operating Days per Year for Each OES for DIBP[a]

OES(s)	Operating Days (days/year)	Basis	Reference(s)
Manufacturing; Incorporation into adhesives and sealants; Incorporation into paints and coatings; Use as a catalyst; Fabrication of final product from articles; Waste handling, treatment, and disposal	250	EPA assumed the manufacture, processing, use or disposal of DIBP occurs 5 days per week during every week of the year except for 2 weeks because of maintenance turnarounds in the case of these OESs.	None
Repackaging into large and small containers	174–260	The number of days during which a chemical substance is repackaged at a repackaging site is equal to this range of values according to the 2022 GS on Chemical Repackaging (U.S. EPA, 2022a).	GS on Chemical Repackaging (U.S. EPA, 2022a).
Application of paints and coatings	225–300	EPA assessed an operating day range of 225–300 days/yr. The lower-bound is based on ESIG's Specific Environmental Release Category Factsheet for Industrial Application of Coatings by Spraying (CEPE, 2020). The upper bound is based on the European Risk Report for DIDP (ECJRC, 2003), which provided a default of 300 days/yr. The mode is based on the GS for Automobile Spray Coating (SAIC, 1996), which estimates 250 days/yr, based on 50 weeks/yr of 5 days/week operation.	ESIG's Specific Environmental Release Category Factsheet for Industrial Application of Coatings by Spraying (CEPE, 2020) European Risk Report for DIDP (ECJRC, 2003) GS for Automobile Spray Coating (SAIC, 1996)
Application of adhesives and sealants	225–300	The number of days during which adhesives and sealant products that contain a certain chemical substance are used at a site is equal to this range of values according to the Emission Scenario Document on Use of Adhesives (OECD, 2015b).	Emission Scenario Document on Use of Adhesives (OECD, 2015b)
Use of laboratory chemicals	174–260	The number of days during which a chemical substance is used at a laboratory is equal to this range of values according to the 2023 GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f).	GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f)
Plastic compounding	148–264	The number of days during which a chemical substance is processed at plastic compounding sites is equal to this range of values according to the Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e).	Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e)

OES(s)	Operating Days (days/year)	Basis	Reference(s)
Plastics converting	137–254	The number of days during which a chemical substance is processed at plastic converting sites is equal to this range of values according to the Generic Scenario on the Use of Additives in Plastics Converting (U.S. EPA, 2021f).	Generic Scenario on the Use of Additives in Plastics Converting (U.S. EPA, 2021f)
Rubber manufacturing	Compounding: 148–264 Converting: 137–254	EPA assumed the number of operating days in the case of rubber compounding and converting is equal to the number of operating days in the case of plastic compounding and converting, respectively.	Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e) Generic Scenario on the Use of Additives in Plastics Converting (U.S. EPA, 2021f)
Recycling	148–264	EPA assumed the number of operating days in the case of recycling is equal to the number of operating days in the case of plastic compounding.	None

[a] The estimation of the number of operating days per for each OES is documented in detail in Section 3 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w).

3.1.3 Consumer Down-the-Drain and Landfills

EPA evaluated down-the-drain and landfill releases of DIBP from consumer COUs qualitatively. The Agency acknowledges there may be DIBP releases to the environment via the cleaning and disposal of adhesives and sealants, and paints and coatings.

Environmental releases can occur from consumer products and articles containing DIBP via the end-of-life disposal of consumer products and articles in the built environment or landfills, as well as from the associated down-the-drain release of DIBP. EPA did not quantify these end-of-life and down-the-drain exposures due to limited reasonably available information on source attribution by consumer COUs. For example, adhesives and sealants as well as paints and coatings can be disposed down-the-drain while consumer users wash their hands, brushes, sponges, and other product applying tools. However, there is limited reasonably available information on wastewater treatment water and the removal of DIBP in drinking water treatment plants that can be matched to individual COUs or product examples. As stated in the *Environmental Media and General Population Exposure and Environmental Exposure for DIBP* (U.S. EPA, 2025v), wastewater treatment is expected to remove 65 to 90 percent of DIBP through sorption to biosolids. In addition, DIBP sorption to biosolids and organic matter results in removal from the aqueous phase by settlement in wastewater treatment processes. Thus, as DIBP is expected to be removed during wastewater treatment, EPA does not expect a significant amount of DIBP to re-enter drinking water.

In addition, adhesives and sealant and paints and coatings products are disposed of when users no longer have use for them or when the products have reached the product shelf life and are taken to landfills. All other solid products and articles can be disposed in landfills or other waste handling locations that properly manage the disposal of products like adhesives and sealants and paints and coatings. DIBP is expected to have a high affinity to particulate (log K_{OC} = 2.67) and organic media (log K_{OW} = 4.34) that would cause significant retardation in groundwater and limit leaching to groundwater. Because of its high hydrophobicity and high affinity for soil sorption, it is unlikely that DIBP will migrate from landfills after groundwater infiltration (U.S. EPA, 2025v).

3.2 Summary of Environmental Releases

3.2.1 Manufacturing, Processing, Industrial and Commercial

Table 3-6 contains the release assessment results for all OESs and the overall confidence score for each OES. See the *Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP)* (U.S. EPA, 2025w) for additional details on deriving the overall confidence score for each OES. For the Fabrication and final use of products or articles as well as the Waste handling, treatment, and disposal OESs, EPA was not able to estimate releases.

Table 3-6. Summary of EPA's Daily Release Estimates for Each OES and EPA's Overall Confidence in these Estimates

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			
Manufacturing	1.1E−04	3.1E−04	Fugitive air	250		1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.74		Stack air					
	4.6E−03		Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	17 [i]	18 [i]	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
Repackaging into large and small containers	8.8E−06	1.4E−05	Fugitive air	208	260	1–355 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	11 [i]	29 [i]	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or landfill					
Incorporation into adhesives and sealants	2.6E−08	5.6E−08	Fugitive air	250		1 site	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.5E−08	8.0E−08	Stack air					
	0.34 [i]	0.37 [i]	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	0.44		Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
Incorporation into paints and coatings	2.1E−06	6.6E−06	Fugitive air	250		1–2 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.3E−06	1.5E−05	Stack air					
	0.19 [i]	0.37 [i]	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment)					
	0.24	0.47	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
Use as a catalyst – formation of pre-catalyst	5.1E−07	1.0E−06	Fugitive air	250		2–5 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	1.3E−06	4.4E−06	Stack air					
	4.6 [i]	8.9 [i]	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			
Use as a catalyst – use as an intermediate in polypropylene manufacturing	1.6E−03	7.8E−03	Stack air	250		19–38 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.0E−03	1.0E−02	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	0.49 [i]	0.83 [i]	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
	2.5E−03	1.1E−02	Incineration, or landfill					
Application of paints and coatings (with engineering controls)	1.6−06	4.7E−06	Fugitive air	258	257	2–127 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	9.9E⁻02	0.29	Stack air					
	4.0E⁻02	0.11	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	0.94	2.7	Incineration or landfill					
Application of paints and coatings (without engineering controls)	1.56E−06	4.66E−06	Fugitive air	258	257	2–127 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	4.0E−02	0.13	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill					
	0.99	2.9	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill					
	4.7E−02	0.12	Incineration or landfill					
Application of adhesives and sealants	2.3E−06	5.3E−06	Fugitive or stack air	214	247	2–823 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.17	0.76	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	236	134			

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			
Use of laboratory chemicals (liquid)	1.2E−07	2.0E−07	Fugitive or stack air	230	236	9–27,858 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	2.0	3.7	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	228	237			
Use of laboratory chemicals (solid)	1.2E−06	3.1E−06	Stack air	231	227	36,873 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	3.1E−06	4.9E−06	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	232	223			
	8.3E−07	2.5E−06	Incineration or landfill	230	227			
	1.1E−03	1.3E−03	Wastewater to on-site treatment or discharge to POTW (with or without pretreatment), incineration, or landfill	234	193			
Fabrication of final product from articles [g]	N/A							
Plastics compounding	3.4E−03	1.7E−02	Fugitive or stack air	216	219	1–9 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.57	4.2	Stack air	218	215			
	1.4	8.8	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	218	216			
	4.6	34	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	204	222			
	1.7	8.4	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	216	219			
	0.39	3.1	Incineration or landfill	218	216			

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			
Plastics converting	1.3E−03	7.4E−03	Fugitive or stack air	214	208	6–70 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	7.6E−02	0.52	Stack air	213	209			
	0.19	1.1	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	213	210			
	0.77	3.3	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	212	208			
	0.23	1.0	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	211	205			
	0.65	2.8	Incineration or landfill	211				
Rubber manufacturing (compounding)	3.2E−04	4.2E−04	Fugitive or stack air	175	234	2 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.12	0.39	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	223	230			
	4.8E−02	0.21	Stack air	224	229			
	0.65	0.92	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	94	123			
	0.16	0.21	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	175	234			
	3.3E−02	0.16	Incineration or landfill	224	229			

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			
Rubber manufacturing (converting)	5.4E−04	2.1E−03	Fugitive or stack air	137	172	2 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	0.13	0.41	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	209	214			
	5.2E⁻02	0.22	Stack air	210	213			
	0.53	3.6	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	202	210			
	0.47	0.67	Incineration or landfill	192	212			
	0.17	0.23	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), or direct to surface water	162	218			
Recycling	1.3E−03	5.5E−03	Stack air	218	214	59 sites	Slight to Moderate	CDR, peer-reviewed literature (GS/ESD)
	1.0E−02	2.5E−02	Fugitive air, wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	218	213			
	1.4E−02	1.9E−02	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill	138	106			
	4.2E−03	5.5E−03	Wastewater to on-site treatment, discharge to POTW (with or without pretreatment)	223	171			
Waste handling, treatment, and disposal [h]	N/A							

OES	Estimated Daily Release Across Sites (kg/site-day)		Type of Discharge[a], Air Emission[b], or Transfer for Disposal[c]	Estimated Release Frequency Across Sites (days)[d]		Number of Facilities[e]	Weight of Scientific Evidence Rating [f]	Source
	Central Tendency	High-End		Central Tendency	High-End			

[a] Direct discharge to surface water; indirect discharge to non-POTW; indirect discharge to POTW
[b] Emissions via fugitive air or stack air, or treatment via incineration
[c] Transfer to surface impoundment, land application, or landfills
[d] For the OESs where a range was used as an input to the monte carlo simulation, EPA calculated the number of release days as the ratio of the annual release rate per site to the daily release rate per site because the outputs of the Monte Carlo software do not include the specific values of the numbers of release days from which the 50th and 95th percentile release rates are calculated. For some OESs, a range of input for operating days was not available and 250 days/yr (5 days/week for 50 weeks/yr) was used as the number of release days.
[e] Where available, EPA used 2020 CDR (U.S. EPA, 2020a), 2020 U.S. County Business Practices (U.S. Census Bureau, 2022), and Monte Carlo models to estimate the number of actual sites that use DIBP for each COU.
[f] See Section 3.2.2 for details on EPA's determination of the weight of scientific evidence rating.
[g] No data were available to estimate releases for this OES and there were no suitable surrogate release data or models. Releases from Fabrication of final product from articles is described qualitatively in the *Environmental Release and Occupational Exposure Assessment for Phthalate (DIBP)* (U.S. EPA, 2025w).
[h] Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred is generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities. Therefore, they may include amounts received at dedicated waste treatment/disposal sites.
[i] Each of these values was calculated by summing the rates of release for various releases that occur at different frequencies. These include releases such as release of sampling waste, which occur at the frequency specified in the table (*e.g.*, 250 days/year) and releases such as the release of equipment cleaning waste, which occur at a lower frequency (*e.g.*, 1 day/year). For example, in the case of the manufacturing OES, the central tendency rates of release of sampling wastes and equipment cleaning wastes are 2.2 and 14.8 kg/site-day, respectively, and the high-end rates of release of sampling wastes and equipment cleaning wastes are 2.9 and 14.8 kg/site-day, respectively. The frequency of the releases of product sampling wastes is 250 days/year but the frequency of release of equipment cleaning wastes is only 1 day/year.

3.2.2 Weight of Scientific Evidence Conclusions for Environmental Releases from Industrial and Commercial Sources

EPA determined the weight of scientific evidence in accordance with the Draft Systematic Review Protocol (U.S. EPA, 2021b). Judgment on the weight of scientific evidence is based on the strengths, limitations, and uncertainties associated with the estimates of the daily rate of release of DIBP from the generic site and the number of release days. The Agency considers factors that increase or decrease the strength of the evidence supporting these release estimate. Factors that increase or decrease the strength of evidence are provided in Table 7-6 of the Draft Systematic Review Protocol (U.S. EPA, 2021b) whereas Table 7-7 provides example judgements based on the information in Table 7-6. The best professional judgment about the weight of scientific evidence is summarized using the descriptors of robust, moderate, slight, or indeterminate (U.S. EPA, 2021b).

Strengths

The strengths of the release estimates in general are as follows: (1) the overall systematic review quality ratings of the references cited in Table 3-4 and Table 3-5 are medium or high; (2) EPA determined sources of releases and the corresponding media of releases or disposal methods at the generic sites of the OESs in accordance with ESDs and GSs that are related to these OESs respectively and that contain well described methodologies; (3) the computational or scientific bases for deriving the estimates of daily rates of release of DIBP from the generic sites of the OESs are robust and all of the data that the Agency used to inform the modeling parameter distributions have overall data quality ratings of either high or medium; and (4) daily rates of release of DIBP were calculated via Monte Carlo simulation from model input parameters that in some cases are variable. Parameter variation increases the likelihood that the calculated daily rates of release of DIBP encompass the true daily release rates.

Limitations

The major limitation of the release estimates in general is uncertainty about the estimates of daily DIBP site throughputs, which are the input variables of the models that EPA used to calculate daily release rates. The reasons for this uncertainty are the uncertainties in the values of the parameters from which the daily DIBP site throughputs were calculated. The following is a discussion of these uncertainties:

- CDR information on the downstream processing and use of DIBP at facilities is limited; therefore, the assessed production volume of an OES is uncertain. EPA estimated production volume deterministically (*i.e.*, as a single value) based on reported CDR data, CDR reporting thresholds, the national aggregate production volume of 407,303 lb for DIBP in 2019 and/or literature data. The exception is the OES of Use as a catalyst where EPA estimated the production volume as a range of values based on literature data.
- EPA estimated the number of release days and the number of sites in the case of most or some OESs, respectively, from the relevant data of GSs, ESDs, or emission release category (specific emission release category [SpERC]) factsheets but these data may not be pertinent in the case of actual sites at which DIBP is manufactured, processed, or used.
- There are uncertainties associated with DIBP-containing product concentrations. In most cases, the number of identified products for a given OES were limited. In such cases, EPA estimated a range of possible concentrations for products in the OES. However, the extent to which these products represent all DIBP-containing products within the OES is uncertain. For OESs with little-to-no reasonably available product data, EPA estimated DIBP concentrations from GSs or ESDs. Due to these uncertainties, the average product concentrations may be under- or overestimated.

In addition to the major limitation discussed above, other limitations are uncertainties in the values of some of the parameters of the models that EPA used to estimate releases. Table 3-7 contains a summary of the assessment approaches in the case of each OES and the strengths and limitations of the release estimates.

Uncertainties
Given the strengths and limitations discussed above, EPA is uncertain that the assessed daily release rates are representative of actual daily release rates of the corresponding COU. Refer to Table 3-7 for discussions of uncertainties in the case of each OESs. Based on the above information, EPA has slight to moderate confidence in the assessed releases.

Table 3-7. Summary of Assessment Approach and Uncertainty in Environmental Release Estimates for DIBP by OES

OES	Assessment Approach and Uncertainty in Release Estimates
Manufacturing	EPA assessed environmental releases using models and model parameters derived from CDR, the 2023 Methodology for Estimating Environmental Releases from Sampling Wastes, and sources identified through systematic review (including industry-supplied data). The Agency used facility-specific reported DIBP manufacturing volumes for 1 facility reporting in CDR.
Repackaging	EPA assessed environmental releases using the assumptions and values from the Chemical Repackaging GS, which the systematic review process rated high for data quality (OECD, 2009b). The Agency also referenced the 2023 Methodology for Estimating Environmental Releases from Sampling Wastes. An uncertainty in the assessment approach is that the default values in the ESD are generic and there is uncertainty in the representativeness of these generic values to actual releases from real-world sites that import and repackage DIBP. In addition, EPA lacks DIBP-specific facility import volume data for the CDR-reporting import and repackaging site; therefore, throughput estimates for these sites are based on the CDR reporting range upper bound of 100,000 lb (45,359 kg). There is uncertainty in the extent to which this estimated volume represents the actual volume of DIBP repackaged, due to CDR reporting thresholds that may result in additional DIBP repackaging sites that are not required to report to CDR. Furthermore, some repackaging sites may not be importers and therefore would not be subject to CDR reporting requirements.
Incorporation into adhesives and sealants	EPA assessed releases to the environment using the Emission Scenario Document on Adhesive Formulation, which also has a high data quality rating from the systematic review process (OECD, 2009a). EPA used DIBP-specific data on concentrations in adhesive and sealant products in the analysis to provide more accurate estimates than the generic values provided by the ESD. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the ESD are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that incorporate DIBP into adhesives and sealants. In addition, EPA lacks DIBP-specific facility production volume data and number of formulation sites; in addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Incorporation into paints and coatings	EPA assessed releases to the environment using the Generic Scenario for Formulation of Waterborne Coatings, which has a medium data quality rating from the systematic review process (U.S. EPA, 2014). The Agency used DIBP-specific data on concentrations in paint and coating products in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS are generic and specific to waterborne coatings, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that incorporate DIBP into paints and coatings and how representative the estimates are for sites formulating other coating types (*e.g.*, solvent-borne coatings). In addition, EPA lacks DIBP-specific facility production volume data and number of formulation sites; therefore, throughput estimates are based on CDR which has a reporting threshold of 25,000 lb (11,340 kg) (*i.e.*, not all potential sites represented) and market data from the 2003 Danish EPA Restriction

OES	Assessment Approach and Uncertainty in Release Estimates
	Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Use as a catalyst	EPA assessed releases to the environment using the Emission Scenario Document on Adhesive Formulation (OECD, 2009a), which has a medium data quality rating from the systematic review process. The Agency used DIBP-specific data on concentrations in different DIBP-containing catalysts in the analysis to provide more accurate estimates than the generic values provided by the ESD. The Zeigler Natta technical report from which these values were obtained have medium data quality ratings from the systematic review process (Company Withheld, XXXX). EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and industry data from the 2019 U.S. polypropylene production volume (Jaganmohan, 2020). Because the default values in the GSs are generic for all types of use sites and the DIBP-specific concentration data was only for Zeigler Natta catalyst, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use catalysts containing DIBP. In addition, EPA lacks DIBP-specific facility production volume data and number of polypropylene manufacturing sites; therefore, throughput estimates are based on CDR, which has a reporting threshold of 25,000 lb (11,340 kg) (*i.e.*, not all potential sites represented) and a magnitude-different low- and high-range of estimated annual DIBP production.
Application of paints and coatings	EPA assessed releases to the environment using the Emission Scenario Document on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a), Emission Scenario Document on the Coating Industry (Paints, Lacquers, and Varnishes) (OECD, 2009c), and Emission Scenario Document on the Application of Radiation Curable Coatings, Inks, and Adhesives via Spray, Vacuum, Roll, and Curtain Coating (OECD, 2011b), which were all assigned a data quality score of medium in systematic review. Additionally, EPA used DIBP-specific data on concentration and application methods of different DIBP-containing paints and coatings in the analysis to provide more accurate estimates than the generic values provided by the GS and ESDs. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS and ESDs are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use DIBP-containing paints and coatings. EPA assessed releases of spray applications of the coatings, which may not be representative of other coating application methods. In addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP used for each OES as presented in the Danish EPA Restriction Report may differ from actual U.S. conditions, adding uncertainty to estimated releases.
Application of adhesives and sealants	EPA assessed releases to the environment using the Emission Scenario Document on Use of Adhesives, which has a medium data quality rating from the systematic review process (OECD, 2015a). Additionally, the Agency used DIBP-specific data on concentration and application methods of different DIBP-containing adhesives and sealant products in the analysis to provide more accurate estimates than the generic values provided by the ESD. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the ESD are generic, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that use DIBP-containing adhesives and sealants. EPA assessed releases of spray applications of the

OES	Assessment Approach and Uncertainty in Release Estimates
	adhesives and sealants, which may not be representative of other coating application methods such as dip application of casting sealant products or the application of grout products. In addition, the Agency lacks DIBP-specific facility use volume data and number of use sites; therefore, EPA based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIDP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Use of laboratory chemicals	EPA assessed releases to the environment using the Generic Scenario on Use of Laboratory Chemicals, which has a high data quality rating from the systematic review process (U.S. EPA, 2023f). The Agency assessed media of release using assumptions from the GS and EPA/OPPT models for solid and liquid DIBP-containing laboratory chemicals. EPA used SDSs from identified laboratory DIBP products to inform product concentration and material states. These SDSs have high data quality ratings from the systematic review process. The Agency lacks DIBP laboratory chemical throughput data and use information from the GS on the Use of Laboratory Chemicals (U.S. EPA, 2023f). Additionally, because no entries in CDR indicate a laboratory use and there were no other sources to estimate the volume of DIBP used in this OES, EPA developed an estimate based on CDR reporting threshold; however, there is uncertainty as to whether this estimate accurately reflects the true volume of DIBP used in laboratory chemicals.
Plastics compounding	EPA modeled releases to the environment using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding, which has a medium data quality rating from the systematic review process (U.S. EPA, 2021e). The Agency used DIBP-specific data on concentrations in different DIBP-containing plastic products and additive throughputs in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. Because the default values in the GS are generic for all types of plastic compounding sites, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that compound DIBP into plastic resin. In addition, EPA lacks DIBP-specific facility production volume data and number of compounding sites; therefore, the Agency based the PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.
Plastics converting	EPA assessed releases to the environment using the Generic Scenario for the Use of Additives in Plastic Converting, which has a medium data quality rating from the systematic review process (U.S. EPA, 2021f). Because the default values in the GS are generic for all types of thermoplastics converting sites and processes, there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that convert DIBP-containing plastic masterbatch into plastic articles via a variety of methods such as extrusion or calendaring. In addition, EPA lacks DIBP-specific facility production volume data and number of converting sites; therefore, the Agency based PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions in the United States, adding uncertainty to estimated releases.

OES	Assessment Approach and Uncertainty in Release Estimates
Recycling	EPA assessed releases to the environment from recycling activities using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding as surrogate to the recycling process. The GS has a medium data quality rating from the systematic review process (U.S. EPA, 2021e). Additionally, the Agency used DIBP-specific data on concentrations in different DIBP-containing plastic products in the analysis to provide more accurate estimates than the generic values provided by the GS. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. EPA referenced information from ENF Recycling, which has a medium quality rating from the systematic review process (ENF, 2024) to estimate the rate of plastic recycling in the United States and applied it to DIBP plastic market share to define an approximate recycling volume of plastic containing DIBP. Because the default values in the GS are generic, there is uncertainty in the representativeness of real-world sites that recycle plastic products containing DIBP. In addition, EPA lacks DIBP-specific plastic recycling rates and facility production volume data; therefore, throughput estimates are based on plastics compounding data and U.S. plastic recycling rates, which are not specific to DIBP.
Waste handling, treatment, and disposal	Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred are generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities. Therefore, they may include amounts received at dedicated waste treatment/disposal sites.
Rubber manufacturing	EPA assessed releases to the environment using the 2021 Generic Scenario for the Use of Additives in Plastic Compounding (U.S. EPA, 2021e) and Generic Scenario for the Use of Additives in Plastic Converting (U.S. EPA, 2021f), both of which have a medium data quality rating from the systematic review process. The Agency used DIBP-specific data on concentrations in different DIBP-containing rubber products in the analysis to provide more accurate estimates than the generic values provided by the GSs. The safety and product data sheets from which these values were obtained have high data quality ratings from the systematic review process. EPA based OES PV on reported production volume from the 2020 CDR (U.S. EPA, 2020a) and market data from the 2003 Danish EPA Restriction Report on DIBP (Danish EPA, 2011). Because the default values in the GSs are generic for all types of plastic compounding and rubber manufacturing sites and the DIBP-specific concentration data was only for rubber products there is uncertainty in the representativeness of generic site estimates of actual releases from real-world sites that compound DIBP into rubber material. In addition, EPA lacks DIBP-specific facility production volume data and number of compounding sites; therefore, throughput estimates are based on CDR, which has a reporting threshold of 25,000 lb (11,340 kg) (*i.e.*, not all potential sites represented) and a magnitude-different low and high range of estimated annual DIBP production. The respective share of DIBP use for each OES as presented in the Danish EPA Restriction Report may differ from actual conditions adding some uncertainty to estimated releases.

3.3 Summary of Concentrations of DIBP in the Environment

Based off the environmental release assessment summarized in Section 3.2 and presented in EPA's *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w), DIBP is expected to be released to the environment via air, water, biosolids, and disposal to landfills. Environmental media concentrations were quantified in ambient air, soil from ambient air deposition, surface water, and sediment. Additional analysis of surface water used as drinking water was conducted for the human health risk assessment (Section 4.1.3). Given the physical and chemical properties and fate parameters of DIBP (Section 2), concentrations of DIBP in soil and groundwater due to both application of biosolids to land and disposal to landfills are only discussed qualitatively.

EPA relied on its fate assessment to determine which environmental pathways to consider for its screening level analysis of environmental exposure and general population exposure. Details on the environmental partitioning and media assessment can be found in *Physical Chemistry and Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag). Briefly, based on DIBP's fate parameters, EPA anticipated DIBP to be predominantly in water, soil, and sediment. Soil concentrations of DIBP from land applications were not quantitatively assessed in the screening level analysis as DIBP was expected to have limited persistence potential and mobility in soils receiving biosolids. To contrast, EPA has greater confidence in quantifying DIBP concentrations in soil resulting from air to soil deposition since it is direct deposition into soil rather than mobility within soil (as with biosolids). Therefore, the Agency quantified air to soil deposition with a screening level approach for the purpose of the environmental exposure assessment.

Details on the screening level assessments of each environmental pathway can be found in EPA's *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). Screening level analyses were used for this assessment because of limited reasonably available environmental monitoring data and lack of location data for DIBP releases. Generally, EPA began each quantitative screening level analysis for environmental and general population exposure assessment using the highest modeled environmental media concentrations for the environmental pathways expected to be of greatest concern. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* (U.S. EPA, 2019c). Additional details of the screening level approaches used for general population exposure is discussed in Section 4.1.3. If any pathways were identified as a pathway of concern for the general population or the environment, further exposure assessments for that pathway would be conducted to include higher tiers of modeling when available, refinement of exposure estimates, and exposure estimates for additional subpopulations and OES/COUs.

EPA began its environmental and general population exposure assessment with a screening level approach using high-end environmental media concentrations for the environmental pathways expected to be of greatest concern. The high-end environmental media concentrations were estimated using the release estimates for an OES that, when combined with conservative assumptions of environmental conditions, resulted in the greatest modeled concentration of DIBP in a given environmental medium. Therefore, EPA did not estimate environmental concentrations of DIBP resulting from all OES presented in Table 3-1.

The OESs resulting in the highest environmental concentration of DIBP are shown in Table 3-8. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* (U.S. EPA, 2019c). Table 3-8 also indicates whether the highest estimate was used for environmental exposure assessment or general population exposure assessment.

For the water pathway, different hydrological flow rates were used for the different screening level exposure scenarios. The 30Q5[4] flows (lowest 30-day average flow that occurs in a 5-year period) are used to estimate acute, incidental human exposure through swimming or recreational contact and acute drinking water exposure. The harmonic mean[5] flows provide a more long-term average estimate that is preferred for assessing potential chronic human exposure via drinking water, and is more protective than an arithmetic mean flow. The harmonic mean is also used for estimating human exposure through fish ingestion because it takes time for chemical concentrations to accumulate in fish. Lastly, for aquatic or ecological exposure, a 7Q10[6] flow (lowest 7-day average flow that occurs in a 10-year period) is used to estimate exceedances of concentrations of concern for aquatic life (U.S. EPA, 2007b). In lieu of facility-specific receiving water body information for DIBP, flow statistics were drawn from a generic distribution of receiving water body flow rates derived from receiving water bodies listed on NPDES permits for facilities with relevant NAICS codes.

The modeled distribution of hydrological flow data are specific to an industry sector rather than a single facility but provides a reasonable estimate of the distribution of location-specific values. The complete methods for retrieving and processing flow data by NAICS code are detailed in Appendix B of the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). Briefly, EPA selected a median flow (P50) from the distribution of resulting receiving water body flow rates across the pooled flow data of all relevant NAICS codes as a conservative low flow condition across modeled releases. Additional refined analyses were conducted for the scenarios resulting in the greatest environmental concentrations by applying the 75th and 90th percentile (P75 and P90, respectively) flow metrics from the distribution to represent a more complete range of potential flow rates. When comparing generic scenario releases and flow percentiles to known releases from facilities within relevant phthalate COUs and their respective receiving waterbodies, EPA was unable to constrain the analysis to a single flow percentile, as the P50, P75, and P90 flows are derived from relevant facilities, and each condition is plausible.

For the screening level assessment, EPA identified the Application of paints and coatings OES as yielding the highest water concentrations using a 7Q10, 30Q5, and harmonic mean flow (Table 3-8).[7] As described in EPA's *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v), the Agency estimated the surface water concentrations for Application of paints and coatings OES using releases estimated from generic scenarios. However, releases associated with the Application of paints and coatings OES were categorized to multiple release categories and the proportion discharged only to surface water was indeterminable. Therefore, EPA conservatively assumed that all releases associated with Application of paints and coating OES went directly to surface water. EPA has slight confidence in this assumption as described in Section 3.3.1.1 but has robust confidence that Application of paints and coatings OES would represent a conservative estimate of surface water concentrations appropriate for use in a screening level assessment. Details on the input assumptions and the confidence of the surface water concentrations can be found in *Environmental Media, General Population, and Environmental Exposure for DBP* (U.S. EPA, 2025v) and partly in Section 3.3.1.1.

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[4] 30Q5 is defined as 30 consecutive days of lowest flow over a 5-year period. These flows are used to determine acute human exposures via drinking water (Versar, 2014).
[5] Harmonic mean is defined as the inverse mean of reciprocal daily arithmetic mean flow values. These flows represent a long-term average and are used to generate estimates of chronic human exposures via drinking water and fish ingestion.
[6] 7Q10 is defined as 7 consecutive days of lowest flow over a 10-year period. These flows are used to calculate estimates of chronic surface water concentrations to compare with the COCs for aquatic life (Versar, 2014).
[7] 7Q10 and 30Q5 are the lowest 7-day average flow that occurs (on average) once every 10 years and the lowest 30-day average flow that occurs (on average) once every 5 years, respectively.

Table 3-8 summarizes the highest concentrations of DIBP estimated in different environmental media based on EPA estimated releases to the environment from various OESs associated with COUs.

The maximum EPA estimated daily release value for fugitive and stack releases for DIBP was 8.82 kg/site-day and categorized under the Plastic compounding OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). Because the release type is unknown, under the methodology used, EPA assumed the entire release was either all fugitive or all stack releases and models the entire release as each type. While this assumption captures the highest release of each type possible, it also limits the analysis to exposure from an individual release type since under this assumption modeled concentrations and deposition rates for fugitive and stack releases are not additive as they cannot happen at the same time. Nonetheless, for this screening level analysis, EPA still provides a total exposure and deposition rate from both release types as if they occurred at the same time. This provides a very conservative exposure scenario and an overestimate of ambient concentrations and deposition rates at the evaluated distances, but ensures findings are health protective. Given the very conservative nature of this modeled exposure scenario, if results indicate the total exposure or deposition rate do not indicate an exposure or risk concern, no further analysis is needed because lower releases would be expected to result in lower exposures and lower associated risks. If results indicated an exposure or risk concern, EPA would conduct a refined analysis using a more representative and real exposure scenario (*e.g.*, only determine exposures and derive risk estimates based on a single release type).

Table 3-8 only shows a summary of the highest environmental media concentration resulting for two OESs (Application of paints and coatings; Plastics compounding). These values were used for the initial screening level analysis. Further refinements, including the consideration of wastewater treatment removal, were applied and discussed in the general population and environmental risk sections in 4.1.3 and 5.3, respectively.

Table 3-8. Summary of High-End DIBP Concentrations in Various Environmental Media from Environmental Releases

OES [a]	Release Media	Environmental Media	DIBP Conc.	Environmental or General Population
Application of Paints and Coatings *without wastewater treatment*	Water	Total water column (7Q10, P50 flow)	2480μg/L	Environmental risk assessment
		Total water column (7Q10, P75 flow)	342 μg/L	Environmental risk assessment
		Total water column (7Q10, P90 flow)	13 μg/L	Environmental risk assessment
		Median 7Q10 P50 (benthic sediment)	107,000 μg/kg	Environmental risk assessment
Application of Paints and Coatings *with wastewater treatment*	Water	Total water column (7Q10, P50 flow)	794 μg/L	Environmental risk assessment
		Total water column (7Q10, P75 flow)	109 μg/L	Environmental risk assessment
		Total water column (7Q10, P90 flow)	4.16 μg/L	Environmental risk assessment
Application of Paints and Coatings *without wastewater treatment*	Water	Surface water (30Q5, P50 flow)	1460 μg/L	General population
		Surface water (30Q5, P75 flow)	203 μg/L	General population
		Surface water (30Q5, P90 flow)	8.5 μg/L	General population
		Surface water (harmonic mean, P50)	954 μg/L	General population
		Surface water (harmonic mean, P75)	107 μg/L	General population
		Surface water (harmonic mean, P90)	4.82 μg/L	General population

OES [a]	Release Media	Environmental Media	DIBP Conc.	Environmental or General Population
Application of Paints and Coatings *with wastewater treatment*	Water	Surface water (30Q5, P50 flow)	467.2 µg/L	General population
		Surface water (30Q5, P75 flow)	65.0 µg/L	General population
		Surface water (30Q5, P90 flow)	2.72 µg/L	General population
		Surface water (harmonic mean, P50)	305.3 µg/L	General population
		Surface water (harmonic mean, P75	34.2 µg/L	General population
		Surface water (harmonic mean, P90)	1.54 µg/L	General population
Plastic compounding (fugitive and stack)	Ambient air	Daily-averaged total (fugitive and stack, 100 m)	17.59 µg/m³	General population
		Annual-averaged total (fugitive and stack, 100 m)	16.45µg/m³	General population

7Q10 = lowest 7-day average flow that occurs (on average) once every 10 years; 30Q5 = lowest 30-day average flow that occurs (on average) once every 5 years; OES = occupational exposure scenario

[a] Table 3-1 provides the crosswalk of OES to COUs.

3.3.1 Weight of Scientific Evidence Conclusions

Detailed discussion of the strengths, limitations, and sources of uncertainty for modeled environmental media concentration leading to a weight of scientific evidence conclusion can be found in EPA's *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). However, the weight of scientific evidence conclusion is summarized below for the modeled concentrations for surface water, including benthic sediment concentrations measured alongside total water column concentrations, and ambient air.

For the screening level assessment, EPA used the release estimates presented in Table 3-6 to model DIBP concentrations in different environmental media. EPA considers additional variables when considering the weight of scientific evidence for its estimation of environmental media concentrations. Some additional considerations include the use of an additional model (*e.g.*, PSC, IIOAC, etc.) using the release as an input, the applicability of the release data to the environmental media being considered, likelihood of an occurrence of a release to the specific environmental compartment, and available monitoring data.

3.3.1.1 Surface Water

Due to the lack of reported release data and lack of reasonably available information for facilities discharging DIBP to surface waters, the high-end, EPA estimated releases for each COU were applied for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant North American Industry Classification System (NAICS) codes and that had National Pollutant Discharge Elimination System (NPDES) permits.

For the screening level assessment, EPA utilized releases associated with the Application of paints and coatings OES as it resulted in the highest surface water concentrations for use in environmental risk and general population risk, respectively. EPA determined the surface water concentration associated with this OES represented a conservative high-end exposure scenario and was appropriate to use in its screening-level assessment to assess all other OESs and their associated COUs.

EPA utilized daily release information as an input to the Variable Volume Water Model with Point Source Calculator Tool (VVWM-PSC) Model to estimate surface water concentrations for use in general population and environmental exposure assessment. As mentioned in Section 3.2, EPA estimated a range for daily releases for each OES. For the Fabrication and final use of products or articles, the Agency was not able to estimate releases, but EPA does not expect them to be greater than releases associated with the Application of paints and coatings OES. The Agency also did not estimate releases from the Waste handling, treatment and disposal OES. Releases from this OES are generally considered to be from waste transferred from upstream life cycle stages. The amounts transferred is generally not known; however, estimates from upstream activities identified as to incineration, landfill, or indirect discharges may include either on-site or off-site treatment activities, so EPA assumed that releases are captured in the upstream OESs. For the screening level assessment, the Agency used the release estimates presented in Table 3-6 to model DIBP concentrations in different environmental media.

For DIBP, daily releases for each OES were estimated using generic scenarios. Table 3-7 summarized EPA's overall weight of scientific evidence conclusions for its DIBP release estimate for each OES. Overall EPA concluded the weight of scientific conclusion was slight to moderate for releases that use GSs/ESDs.

As shown in Table 3-6 daily releases to water for each OES were reported to the following categories for DIBP:

- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment)
- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill
- Wastewater to onsite treatment, discharge to POTW (with or without pretreatment), or landfill
- Fugitive air, wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill

Only the discharge type categorized as Wastewater to onsite treatment, discharge to POTW (with or without pretreatment) is known to be discharged only to water. For the other releases categorized as releasing to multiple media types, EPA could not differentiate the proportion of DIBP released only to surface water. For these generic scenario OESs, there was insufficient data to quantify estimated releases specifically to surface water unless releases only to surface water were also estimated for that OES. The Application of paints and coatings OES, which was utilized for screening, had releases associated with multiple media types (fugitive air, wastewater to onsite treatment, discharge to POTW (with or without pretreatment), direct to surface water, incineration, or landfill). Therefore, EPA conservatively assumed that all releases associated with the Application of paints and coatings OES went directly to surface water. EPA has slight confidence in this assumption but robust confidence that Application of paints and coatings OES represents a conservative estimate of surface water concentrations appropriate for use in a screening level assessment. For all other OESs with estimated releases, surface water concentrations were lower than the surface water concentration estimated for Application of paints and coatings, which was used as the high-end estimate for screening analysis.

Table 3-9 below identifies the data available for use in modeling surface water concentrations for each OES, and EPA's confidence in the estimated surface water concentrations used for exposure assessment. In considering the various OESs for use in a screening assessment, EPA identified Application of paints and coatings OES for use in environmental exposure and general population exposure, respectively. EPA determined this OES as most appropriate for use in screening as it resulted in a high-end surface water concentration based on many conservative assumptions, such as the assumption that there is no removal of DIBP prior to release in surface water. The Agency has only slight confidence in the high-end estimated concentrations for the Application of paints and coatings OES, with a bias toward overestimation when assuming 100 percent discharge to only surface water, due to the uncertainty around the portion of the total estimated release being discharged to surface water. The incorporation of higher percentile flows (P75 and P90) with the high-end release estimates increase confidence in the representativeness of the concentrations presented. The Agency has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation, which represent an upper bound due to the conservative assumptions used. Other model inputs were derived from reasonably available literature collected and evaluated through EPA's systematic review process for TSCA risk evaluations. All monitoring and experimental data included in this analysis were from articles rated as medium- or high-quality from this process. The high-end modeled concentrations in the surface water and sediment exceeded the highest values available from monitoring studies by more than an order of magnitude. This confirms EPA's expectation that modeled concentrations for DIBP presented in this risk evaluation are biased toward overestimation and are appropriate to be used as a screening evaluation.

Overall, EPA has robust confidence that the high-end estimated surface water concentration modeled using the Application of paints and coatings OES is appropriate to use in its screening level assessment to assess all other OESs and their associated COUs—including OESs and COUs with releases that could not be quantified. Risk to the general population and the environment from surface water concentrations are described in Section 4.1.3 and 5.3.2, respectively.

Table 3-9. DIBP Release Data Used for Modeling Surface Water Concentrations

OES	Water Release Data Type	Description of Analysis
Application of paints and coatings	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA calculated a surface water concentration based on the assumption that the total multimedia release was directed to surface water. Due to the uncertainty around the portion of the release being discharged to surface water, EPA has only slight confidence in the estimated value for this OES, but robust confidence that the estimated concentration represents a high-end value appropriate for use in a screening assessment.
Plastic compounding; Plastic converting; Incorporation into adhesives and sealants; Incorporation into paints and coatings; Rubber manufacturing – compounding; Rubber manufacturing – converting; Manufacturing; Recycling	Generic Scenario (water-specific)	No facilities reported releases for these OES, so EPA modeled releases using generic scenarios. Industry process data were sufficient to model a surface water-specific release, and the resulting range of estimated concentrations were below the high-end releases applied for screening. Therefore, EPA has robust confidence that this OES is captured using its screening assessment.

OES	Water Release Data Type	Description of Analysis
Use as a catalyst – formulation into pre-catalyst; Repackaging into large and small containers; Use as a catalyst – intermediate in polypropylene manufacturing; Application of adhesives and sealants; Use of laboratory chemicals – solids and liquids	Generic Scenario (multimedia)	No facilities reported releases for this OES, so EPA modeled releases using generic scenarios. Because EPA was unable to model releases to just surface water, EPA calculated a surface water concentration based on the assumption that the total multimedia release was directed to surface water, and the resulting range of estimated concentrations were below the high-end releases applied for screening. EPA has robust confidence that the OES selected for screening will cover this OES.

3.3.1.2 Ambient Air

EPA used the IIOAC Model, previously peer-reviewed methodology for fenceline communities (U.S. EPA, 2022b) and integrated recommendations from that and other peer-reviews to evaluate exposures and deposition rates via the ambient air pathway for this assessment. The IIOAC Model was developed based on a series of pre-run scenarios within AERMOD (the Agency's regulatory model) which gives EPA greater confidence in the IIOAC results. However, since results from IIOAC are based on the pre-run AERMOD scenarios, IIOAC modeling is limited to the parameters (*e.g.*, stack parameters, meteorological data, and other factors) used as inputs to those pre-run AERMOD scenarios. The screening level analyses presented in this assessment, IIOAC provides reliable and reproduceable results which can be used to characterize upper-bound exposures and derive screening level risk estimates, giving EPA moderate confidence in the results and findings.

DIBP did not have any reported releases in the databases EPA typically relies upon for facility reported release data (*e.g.*, TRI or NEI). Therefore, the screening level analysis for ambient air for DIBP relied upon EPA-estimated releases and uses the maximum EPA-estimated daily releases of DIBP across all OES/COUs as direct inputs to the IIOAC Model to estimate ambient concentrations of DIBP. The EPA-estimated releases are based on a series of conservative assumptions, production volumes, durations, and other factors that may overestimate the releases modeled. To determine daily releases, the Agency uses the EPA estimated annual release data and number of operating days to calculate daily average releases used for modeling. This approach assumes operations are continuous and releases are the same for each day of operation.

Taken together, the calculation of daily average releases and assumption releases are the same for each day of operation may underestimate short-term or daily exposure and deposition rates because these estimates may miss actual short-term peak releases (and associated exposures) if higher or lower releases occur on different days due to changes in operation or other factors. This gives the Agency lower confidence the EPA-estimated releases are representative. However, the use of conservative assumptions when estimating releases and the use of the maximum EPA-estimated release across all OES/COUs as direct inputs to the IIOAC Model to estimate ambient concentrations gives the agency moderate confidence that high-end releases are not missed. EPA Overall, EPA has moderate confidence that the releases and estimated air concentrations and deposition rates are appropriate and health protective for a screening level analysis. The uncertainties associated with the EPA-estimated release data used for this screening level assessment are detailed in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) and carry over to the ambient air exposure assessment.

The maximum EPA-estimated daily release value used for the ambient air assessment was categorized under the Plastic compounding OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). As described in the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v), since the release type is unknown EPA assumed the entire release was either entirely fugitive or entirely stack release and models each release type separately. Under this assumption, the modeled concentrations and deposition rates attributable to either all fugitive or all stack releases are not additive and do not align temporally as they cannot happen at the same time. Nonetheless, EPA still provides a total exposure and deposition rate from both release types assuming they occurred at the same time for this screening level assessment. This assumption results in a very conservative "total exposure" to DIBP, ensures possible exposures are not missed, and retains health protective exposure and associated risks estimates. Given these assumptions, the Agency has slight confidence in the exposure scenario modeled (cannot occur at the same time under the assumptions modeled) and recognizes results are likely overestimates of ambient concentrations and deposition rates at the evaluated distances.

Due to the conservative assumptions made along with the use of the highest release estimates and the combination of modeled concentrations for fugitive and stack release types even though they do not align temporally and cannot happen at the same time, EPA has robust confidence the modeled ambient air concentrations and deposition rates are appropriately conservative to use for a screening level analysis for all OESs and associated COUs. Risk to the general population from ambient air concentrations are described in Section 4.1.3 and Section 4.3.4.

4 HUMAN HEALTH RISK ASSESSMENT

DIBP – Human Health Risk Assessment (Section 4):
Key Points

EPA evaluated all reasonably available information to support human health risk characterization of DIBP for workers, ONUs, consumers, bystanders, and the general population, including PESS. Exposures to workers, ONUs, consumers, bystanders, and the general population are described in Section 4.1. Human health hazards are described in Section 4.2; human health risk characterization is described in Section 4.3.

Exposure Key Points

- EPA assessed inhalation and dermal exposures for workers and ONUs, as appropriate, for each COU (Section 4.1.1). Both dermal and inhalation were primary routes of exposure, depending on the OES.
- EPA assessed inhalation, dermal, and oral exposures for consumers and bystanders, as appropriate, for each COU (Section 4.1.2) in scenarios that represent a range of use patterns and behaviors. The primary route of exposure was dermal for most products.
- EPA assessed inhalation, oral, and dermal exposures for the general population, as appropriate, via surface water, drinking water, ambient air, and fish ingestion for tribal populations. The Agency determined that all exposures assessed for the general population were not of concern (Sections 4.1.3 and 4.3.4).
- EPA assessed non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP for the U.S. civilian population using NHANES urinary biomonitoring data and reverse dosimetry (Section 4.4.2).

Hazard Key Points

- EPA identified effects on the developing male reproductive system as the most sensitive and robust non-cancer hazard associated with oral exposure to DIBP in experimental animal models (Section 4.2).
- A non-cancer point of departure (POD) of 5.7 mg/kg-day was selected to characterize non-cancer risks for acute, intermediate, and chronic durations of exposure. A total uncertainty factor (UF) of 30 was selected for use as the benchmark margin of exposure (MOE).
- EPA derived draft relative potency factors (RPFs) based on a common hazard endpoint (*i.e.*, reduced fetal testicular testosterone). Draft RPFs were derived via meta-analysis and benchmark dose (BMD) modeling (Section 4.4.1). Given its limited toxicological dataset, scaling by the RPF and application of the index chemical POD provides a more sensitive and robust dose-response assessment than the DIBP-specific point of departure POD.

Risk Assessment Key Points

- Inhalation exposure drive acute non-cancer risks to workers in occupational settings (Section 4.3.2).
- Dermal and inhalation exposures drive acute non-cancer risks to consumers (Section 4.3.3).
- No potential non-cancer risk was identified for the general population (Section 4.3.4).
- EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis supporting this draft risk evaluation (Section 4.3.5).
- EPA considered cumulative risk to workers and consumers through exposure to DIBP from individual COUs in combination with cumulative non-attributable national exposure to DEHP, DBP, BBP, DIBP, and DINP as estimated from NHANES biomonitoring data (Sections 4.4).

4.1 Summary of Human Exposures

4.1.1 Occupational Exposures

The following subsections describe EPA's approach to the assessment of occupational exposures, summarize the weight of scientific evidence conclusions, and provide exposure assessment results for each OES. EPA assessed exposures that result from the manufacturing, processing, use, and disposal of

DIBP. The Agency assessed the exposure of two occupational exposure groups, which are workers and ONUs. Workers work with or in close proximity to DIBP and may handle DIBP while ONUs do not directly handle DIBP but may be indirectly exposed to it as part of their employment. The Agency evaluated the following exposures: inhalation exposure of workers and ONUs to vapor, mist and dust, dermal exposure of workers to liquid and solids, and dermal exposure of ONUs to mist and dust that deposits on surfaces.

Table 4-1 summarizes the number of facilities and total number of exposed workers for all OESs. For scenarios in which the results are expressed as a range, the lower end of the range is based on the 50th percentile estimate of the number of sites and the upper end of the range is based on the 95th percentile estimate of the number of sites. More information on the method used to estimate the number of workers and ONUs can be found in Section 2 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w).

Table 4-1. Summary of Total Number of Workers and ONUs Potentially Exposed to DIBP for Each OES

Occupational Exposure Scenario (OES)	Total Exposed Workers	Total Exposed ONUs	Number of Facilities	Notes
Manufacturing	22	9	1	Number of workers and ONU estimates based on Burau of Labor Statistics (BLS) and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on identified sites from CDR.
Repackaging	1–4	1–2	1 (central tendency); 4 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Incorporation into paints and coatings	14–28	5–10	1 (central tendency); 2 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Incorporation into adhesives and sealants	18	7	1	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Use as a catalyst	66–110	27–45	3 (central tendency); 5 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Application of adhesives and sealants	270–864	85–272	5 (central tendency); 16 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Application of paints and coatings	72–336	36 (central tendency); 168 (high-end)	6 (central tendency); 28 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.

Occupational Exposure Scenario (OES)	Total Exposed Workers	Total Exposed ONUs	Number of Facilities	Notes
Use of laboratory chemicals – liquid	20–202	80–808	20 (central tendency); 202 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Use of laboratory chemicals – solid	36,873	147,492	36,873	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Plastics compounding	135–243	60–108	5 (central tendency); 9 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Plastics converting	684–1,206	335–190	38 (central tendency);67 (high-end)	Number of workers and ONU estimates based on BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on results from Monte Carlo modeling.
Fabrication of final products from articles	N/A			Number of sites data was unavailable for this OES.
Recycling and disposal	354	236	59	Number of workers and ONU estimates based on the BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on industry data (ENF, 2024).
Rubber manufacturing	27	7	2	Number of workers and ONU estimates based on the BLS and U.S. Census Bureau data (U.S. BLS, 2023; U.S. Census Bureau, 2015). Number of facilities estimate based on identified sites from CDR.

4.1.1.1 Assessment Approach and Weight of Scientific Evidence Conclusions

As discussed in Section 3.1.1.1, EPA developed OESs to assess exposures that potentially result from the COUs, and Table 3-1 provides a crosswalk between COUs and OESs. The Agency assessed occupational inhalation exposures for all OESs via mathematical modeling or surrogate monitoring data due to the lack of readily available chemical-specific data. These approaches involve the assessment of the occupational exposures to DIBP that result from the worker activities that occur at the generic site of each OES. The following is a summary of all of the possible worker activities that EPA determined: unloading, cleaning of transport containers, sampling, equipment cleaning, changing filter media, packaging, product use and product disposal. The specific worker activities in the case of each OES and the corresponding exposure routes and physical forms of DIBP that workers are exposed to (*i.e.*, vapor, mist, dust, liquid, and/or solid) are stated in Section 3 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). EPA estimated the DIBP inhalation exposure concentrations and the DIBP dermal acute potential dose rates (APDR) that potentially result from these workers activities.

EPA calculated worker inhalation exposure concentrations in accordance with three inhalation exposure models. (1) the EPA Mass Balance Inhalation Model in the case of exposure to DIBP vapor, (2) the Generic Model for Central Tendency and High-End Inhalation Exposure to Total and Respirable Particulates Not Otherwise Regulated (PNOR Model) (U.S. EPA, 2021d) in the case of exposure to dust that contains DIBP, and (3) the Automotive Refinishing Spray Coating Mist Inhalation Model (OECD, 2011a) in the case of exposure to mist that contains DIBP. The EPA Mass Balance Inhalation Model is a one box model. The generation rate of the chemical substance is the input variable of this model. EPA equated generation rates to the pertinent DIBP vapor release rates that the Agency calculated as part of the assessment of DIBP releases to the environment; these are the DIBP vapor release rates that are related to the assessed worker activities. The Agency conducted Monte Carlo simulation to calculate DIBP vapor inhalation exposure concentrations in accordance with The EPA Mass Balance Inhalation Model. The other two models mentioned above are models that incorporate surrogate inhalation exposure monitoring data and exposure concentrations were calculated without conducting Monte Carlo simulation. In the case of the PNOR Model, the surrogate data are respirable dust inhalation exposure concentrations that are derived from OSHA CEHD data (OSHA, 2020). In the case of the Automotive Refinishing Spray Coating Mist Inhalation Model, the surrogate data are inhalation exposure concentrations of mist that workers are potentially exposed to during spray painting at auto refinishing shops.

The inhalation exposure estimation methods described above are not methods for the evaluation of ONU exposures; therefore, EPA assumed that worker central tendency inhalation exposure values were representative of ONU inhalation exposures. The *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) provides additional details on the development of approaches and the exposure assessment results. Regarding occupational dermal exposure, EPA did not identify any DIBP-specific dermal absorption data in human skin. However, DBP and DIBP are isomers with similar physical-chemical properties and similar rates of dermal absorption in live rats (Elsisi et al., 1989). Therefore, the Agency utilized dermal absorption data of DBP (Beydon et al., 2010) as surrogate for DIBP and assessed dermal exposure to liquid DIBP from this flux value (*i.e.*, 5.9×10^{-4} mg/cm^2/h). Dermal absorption of DIBP from solid materials was estimated using aqueous absorption modeling (U.S. EPA, 2023b, 2004), which resulted in a lower rate of absorption (*i.e.*, 1.7×10^{-4} mg/cm^2/h) than the liquid case. EPA assessed high-end and central tendency inhalation and dermal exposures of workers and ONUs in the case of each OES. For adult workers the surface area of contact was assumed equal to the area of one hand (*i.e.*, 535 cm^2 for males and 445 cm^2 for females) or two hands (*i.e.*, 1,070 cm^2 for males and 890 cm^2 for females) for central tendency or high-end exposures, respectively (U.S. EPA, 2011a). Dermal exposures to ONUs were considered for scenarios with dust or mist generating activities since it is possible that an ONU may experience incidental contact with a contaminated surface. For scenarios with potential ONU dermal exposures, the surface of incidental contact was assumed equal to the surface area of one palm of an adult male (*i.e.*, 268 cm^2).

EPA evaluated the quality of the models and data sources using the data quality review evaluation metrics and the rating criteria described in the Draft Systematic Review Protocol (U.S. EPA, 2021b). The Agency assigned an overall quality level of high, medium, or low to the relevant data. In addition, EPA established an overall confidence level for the data when integrated into the occupational exposure assessment. The Agency also considered the assessment approach, the quality of the data and models, and uncertainties in assessment results to assign an overall weight of scientific evidence rating of robust, moderate, or slight.

For inhalation and dermal exposure routes, EPA provided occupational exposure results representative of central tendency and high-end exposure conditions. The central tendency is expected to represent occupational exposures in the center of the distribution for a given COU. For this risk evaluation, EPA used the 50th percentile (median), mean (arithmetic or geometric), mode, or midpoint values of a distribution as representative of the central tendency scenario. Although the Agency preferred to provide the 50th percentile of the distribution, if the full distribution was unknown, EPA may assume that the mean, mode, or midpoint of the distribution represents the central tendency, depending on the statistics available for the distribution. The high-end exposure is expected to be representative of occupational exposures that occur at probabilities above the 90th percentile but below the highest exposure for any individual (U.S. EPA, 1992). For risk evaluation, EPA provided high-end results at the 95th percentile. If the 95th percentile was not reasonably available, the Agency used a different percentile greater than or equal to the 90th percentile but less than or equal to the 99th percentile, depending on the statistics available for the distribution. If the full distribution was not known and the preferred statistics were not reasonably available, EPA estimated a maximum or bounding estimate in lieu of the high-end.

Table 4-2 provides EPA's overall confidence rating and whether the Agency used modeling to estimate inhalation and dermal exposures for workers. No monitoring data were reasonably available.

Table 4-2. Assessment Approach and Weight of Scientific Evidence Conclusions for OESs

OES	Inhalation Exposure				Dermal Exposure			
	Modeling [a]		Weight of Scientific Evidence Conclusion		Modeling [a]		Weight of Scientific Evidence Conclusion	
	Worker	ONU	Worker	ONU	Worker	ONU	Worker	ONU
Manufacturing	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Repackaging into large and small containers	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Incorporation into adhesives and sealants	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Incorporation into paints and coatings	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Use as a catalyst	✓	✓	Moderate	Slight to Moderate	✓	N/A	Moderate	N/A
Application of paints and coatings	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Application of adhesives and sealants	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Use of laboratory chemicals	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Fabrication of final products from articles	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Plastics compounding	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Plastics converting	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Recycling	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Waste handling, treatment, and disposal	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate
Rubber manufacturing	✓	✓	Moderate	Slight to Moderate	✓	✓	Moderate	Slight to Moderate

OES	Inhalation Exposure				Dermal Exposure			
	Modeling [a]		Weight of Scientific Evidence Conclusion		Modeling [a]		Weight of Scientific Evidence Conclusion	
	Worker	ONU	Worker	ONU	Worker	ONU	Worker	ONU

ONU = occupation non-user
[a] Occupational exposure was assessed via mathematical modeling because worker monitoring data are not reasonably available.

4.1.1.2 Summary of Inhalation Exposures

Table 4-3 presents a summary of the inhalation exposure assessment results. This table provides a summary of the 8-hour time weighted average (8-hour TWA) exposure estimates for all routes (*i.e.*, vapor, mist, and particulate), as well as the Acute Dose (AD), the intermediate average daily dose (IADD), and the average daily dose (ADD) for females of reproductive age. The *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) provides exposure results for average adult workers and ONUs. This assessment also provides additional details regarding AD, IADD, and ADD calculations along with EPA's approach and methodology for estimating exposures. For OESs where there is potential for vapor inhalation exposures, EPA assessed inhalation exposure to vapor to be equal to the surrogate manufacturing vapor exposure concentrations.

Table 4-3. Summary of Female Workers of Reproductive Age Inhalation Exposure Results for Each OES

OES	Inhalation Estimates (Female Workers of Reproductive Age)							
	All Routes 8-Hour TWA (mg/m^3)		AD (mg/kg/day)		IADD (mg/kg/day)		ADD (mg/kg/day)	
	CT	HE	CT	HE	CT	HE	CT	HE
Manufacturing[a]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Repackaging into large and small containers[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.1E−04	1.7E−03
Incorporation into adhesives and sealants[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Incorporation into paints and coatings[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Use as catalyst – formation into pre-catalyst[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Use as catalyst – intermediate in polypropylene manufacturing[c]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Application of paints and coatings – spray application[d]	0.34	22	4.7E−02	3.1	3.4E−02	2.2	3.2E−02	2.1
Application of paints and coatings – non-spray application[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.8E−04	1.7E−03
Application of adhesives and sealants – spray application[d]	2.0	22	0.28	3.1	0.21	2.2	0.18	2.1

OES	Inhalation Estimates (Female Workers of Reproductive Age)							
	All Routes 8-Hour TWA (mg/m³)		AD (mg/kg/day)		IADD (mg/kg/day)		ADD (mg/kg/day)	
	CT	HE	CT	HE	CT	HE	CT	HE
Application of adhesives and sealants – non-spray application[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.5E−04	1.7E−03
Use of laboratory chemicals – liquids[b]	4.0E−03	1.8E−02	5.5E−04	2.5E−03	4.1E−04	1.9E−03	3.6E−04	1.7E−03
Use of laboratory chemicals – solids[e]	1.9E−04	2.7E−03	2.6E−05	3.7E−04	1.9E−05	2.7E−04	1.7E−05	2.6E−04
Fabrication of final product from articles[e]	4.0E−02	0.36	1.0E−02	5.0E−02	4.1E−03	3.6E−02	4.0E−03	3.0E−02
Plastics compounding[c]	4.2E−03	2.1E−02	5.8E−04	2.9E−03	4.2E−04	2.1E−03	3.5E−04	2.0E−03
Plastics converting[c]	2.1E−02	0.37	2.9E−03	5.1E−02	2.1E−03	3.7E−02	1.7E−03	3.5E−02
Recycling[c]	5.2E−02	0.72	7.2E−03	9.9E−02	5.3E−03	7.3E−02	4.4E−03	6.8E−02
Waste handling, treatment, and disposal[c]	5.2E−02	0.72	7.2E−03	9.9E−02	5.3E−03	7.3E−02	4.4E−03	6.8E−02
Rubber compounding[c]	0.10	1.0	1.4E−02	0.14	1.0E−02	0.10	8.9E−03	9.6E−02
Rubber converting[c]	5.0E−02	0.96	6.9E−03	0.13	5.1E−03	9.7E−02	4.1E−03	9.1E−02

AD = acute dose (8 hours for a single workday); ADD = chronic average daily dose (8 hours per workday for 250 days per year for 31 or 40 working years); CT = central tendency; HE = high-end; IADD = intermediate average daily dose (8 hours per workday for 22 days per 30-day period); OES = occupational exposure scenario; TWA = time-weighted average

[a] This OES involves worker inhalation exposure to DIBP vapor only. The inhalation exposure concentrations related to various worker activities were calculated in accordance with the EPA Mass Balance Inhalation Model and then an 8-hour TWA exposure concentration was calculated as a TWA of these concentrations and EPA assessed inhalation exposure concentration to be equal to this 8-hour TWA exposure concentration.

[b] These OESs involve worker inhalation exposure to DIBP vapor only. EPA assessed inhalation exposure concentrations in the case of each OES to be equal to the assessed inhalation exposure concentrations of the Manufacturing OES.

[c] These OESs involve worker inhalation exposure to DIBP vapor and to dust that contains DIBP. To estimate exposure to DIBP vapor, EPA estimated the inhalation exposure concentrations of all workers associated with these OESs to be equal to the assessed inhalation exposure concentrations of the Manufacturing OES. To estimate exposure to dust that contains DIBP, the Agency estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with the PNOR Model. The Agency then conservatively assumed that all workers of these OESs are exposed to vapor and to dust during a single shift and assessed inhalation exposure in the case of all OESs by aggregating the estimated DIBP vapor inhalation exposure concentrations and the DIBP dust inhalation exposure concentrations.

[d] These OESs involve worker inhalation exposure to mist that contains DIBP. EPA estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with Automotive Refinishing Spray Coating Mist Inhalation Model.

[e] These OESs involve worker inhalation exposure to dust that contains DIBP. EPA estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with the PNOR Model.

4.1.1.3 Summary of Dermal Exposures

Table 4-4 presents a summary of dermal exposure results, which are based on reasonably available empirical dermal absorption data for a surrogate chemical (*i.e.*, DBP) as well as dermal absorption modeling of DIBP. Flux-based dermal approaches were considered more appropriate because DIBP has a relatively low rate of absorption (*i.e.*, 5.9×10^{-4} mg/cm^2/h) and low volatility. This table provides a summary of the acute potential dose rate (APDR) for occupational dermal exposure estimates for female workers of reproductive age, as well as the AD, the IADD, and the chronic ADD. The *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) provides exposure results for average adult workers and ONUs. The *Environmental Release and Occupational Exposure Assessment for DIBP* also provides additional details regarding AD, IADD, and ADD calculations along with EPA's approach and methodology for estimating dermal exposures.

Table 4-4. Summary of Female Workers of Reproductive Age Dermal Exposure Results for Each OES

OES	Dermal Exposure Estimates (Female Workers of Reproductive Age)									
	Exposure Type[a]		APDR[a b] (mg/day)		AD[a] (mg/kg/day)		IADD[a] (mg/kg/day)		ADD[a] (mg/kg/day)	
	Liquid[c]	Solid[c]	CT[a d]	HE[a d]	CT[a d]	HE[a d]	CT[a d]	HE[a d]	CT[a d]	HE[a d]
Manufacturing	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Repackaging into large and small containers	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.7E−02	4.0E−02
Incorporation into adhesives and sealants	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Incorporation into paints and coatings	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Use as a catalyst – formation into pre-catalyst	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Use as a catalyst – intermediate in polypropylene manufacturing	✓	✓	2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Application of paints and coatings – spray application	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Application of paints and coatings – non-spray application	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	2.0E−02	4.0E−02
Application of adhesives and sealants – spray application	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.8E−02	4.0E−02
Application of adhesives and sealants – non-spray application	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.8E−02	4.0E−02

OES	Dermal Exposure Estimates (Female Workers of Reproductive Age)									
	Exposure Type[a]		APDR[a b] (mg/day)		AD[a] (mg/kg/day)		IADD[a] (mg/kg/day)		ADD[a] (mg/kg/day)	
	Liquid[c]	Solid[c]	CT[a d]	HE[a d]	CT[a d]	HE[a d]	CT[a d]	HE[a d]	CT[a d]	HE[a d]
Use of laboratory chemicals – liquids	✓		2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.9E−02	4.0E−02
Use of laboratory chemicals – solids		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.4E−03	1.1E−02
Fabrication of final product from articles		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.7E−03	1.1E−02
Plastics compounding	✓	✓	2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.8E−02	4.0E−02
Plastics converting		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.0E−03	1.1E−02
Recycling		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.1E−03	1.1E−02
Waste handling, treatment, and disposal		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.1E−03	1.1E−02
Rubber compounding	✓	✓	2.1	4.2	2.9E−02	5.8E−02	2.1E−02	4.3E−02	1.9E−02	4.0E−02
Rubber converting		✓	0.61	1.2	8.4E−03	1.7E−02	6.1E−03	1.2E−02	5.0E−03	1.1E−02

[a] AD = acute dose; ADD = average daily dose; APDR = acute potential dose rate; IADD = intermediate average daily dose; CT = central tendency; HE = high-end

[b] APDR values are reported for either liquid or solid exposure types as indicated by the "Exposure Type" column

[c] EPA used surrogate dermal absorption data for neat DBP to estimate occupational dermal exposures for liquids containing DIBP (Beydon et al., 2010). The study received a rating of medium from EPA's systematic review process. EPA used an aqueous absorption model to estimate occupational dermal exposures for solid (U.S. EPA, 2023b, 2004). If both liquid and solid exposures may occur for an OES, EPA estimated dermal exposures based on exposure with a liquid material containing DIBP.

[d] For female workers of reproductive age, central tendency means the surface area of contact was assumed equal to the area of one hand (*i.e.*, 445 cm^2) and high-end means the surface area of contact was assumed equal to the area of two hands (*i.e.*, 890 cm^2) (U.S. EPA, 2011a).

4.1.1.4 Assessment Methodology and Discussion of the Weight of Scientific Evidence

This section contains summaries of the occupational exposure assessment methodologies of the various OESs in Table 4-5; complete descriptions of these methodologies are provided in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). This section also contains discussions of the weight of scientific evidence in the case of the various OESs. EPA determined the weight of scientific evidence in accordance with the Draft Systematic Review Protocol (U.S. EPA, 2021b). Judgment on the weight of scientific evidence is based on the strengths, limitations, and uncertainties associated with the exposure estimates. The Agency considers factors that increase or decrease the strength of the evidence supporting the exposure estimate. Factors that increase or decrease the strength of evidence are given in Table 7-6 of the Draft Systematic Review Protocol (U.S. EPA, 2021b) and Table 7-7 of this reference provides example judgements. The best professional judgment about the weight of scientific evidence is summarized using the descriptors of robust, moderate, slight, or indeterminate (U.S. EPA, 2021b).

A strength associated with the DIBP occupational exposure estimates in this assessment is that worker body weight, which is an exposure factor of inhalation and dermal exposure, and worker breathing rate, which is an exposure factor of inhalation exposure, were informed by moderate to robust data sources. An uncertainty that is associated with the exposure estimates in general is the assessment of inhalation exposure of ONUs. EPA assumed that worker central tendency inhalation exposure values were representative of ONU exposures. Exposures for ONUs can vary substantially and exposure levels may be variable based on the amount of time spent in proximity to the chemical. Another uncertainty that is associated with the DIBP occupational exposure estimates in general is that EPA calculated ADD values assuming that workers and ONUs are regularly exposed during their entire working lifetime, which likely results in an overestimate. For example, individuals may change jobs during the course of their career such that they are no longer exposed to DIBP, and the actual ADD values become lower than the estimates presented. Table 4-5 contains discussions of overall weight of scientific evidence for DIBP exposure assessments for each OES.

Table 4-5. Summary of Assessment Methodology and Discussion of the Weight of Scientific Evidence by OES

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Manufacturing	***Summary of the Assessment Method*** EPA assessed inhalation exposure of workers resulting from DIBP fugitive emissions, which are vapor emissions only, that occur during DIBP manufacturing. EPA determined the sources of these fugitive emissions based on the ESD on the Chemical Industry (OECD, 2011c), and these sources are associated with the following worker activities: product sampling, equipment cleaning and loading of DIBP into transport containers. The Agency calculated the concentration of DIBP vapor that workers are potentially exposed to via inhalation in the case of each of these worker activities in accordance with the EPA Mass Balance Inhalation Model The DIBP vapor release rate is the input variable of this model, and EPA calculated the rate of release of DIBP vapor from each of the above-mentioned release sources as a probability distribution as part of the assessment of DIBP releases that is discussed Section 3. EPA also determined the values of 2 of the model parameters, which are the ventilation rate and the mixing factor, as probability distributions because of uncertainty about the values of these model parameters. The agency incorporated via Monte Carlo simulation all of the above-mentioned probability distributions into the calculation of exposure concentrations and calculated these concentrations as probability distributions. The Agency then assumed all of the 3 worker activities are done by the same worker during a single 8-hour shift and calculated an 8-hour TWA exposure concentration as a time-weighted average of the 3 calculated concentrations. This time-weighted average concentration was calculated from the exposure durations of the 3 worker activities and these exposure durations were equated to the durations of release from each of the release sources which were determined as part of the assessment of DIBP releases that is discussed in Section 3. This 8-hour TWA concentration was calculated as a probability distribution and EPA assessed the inhalation exposure concentration of the manufacturing OES to be equal to this concentration probability distribution. The Agency assessed both the central tendency and high-end exposure frequencies to be equal to the number of operating days, which EPA estimated as a discrete value of 250 days per year in accordance with EPA's typical assumption related to the number of operating days of lower-PV specialty chemicals. Appendix D.2 and Appendix D.14 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) contains detailed information about the releases and occupational exposure models of the manufacturing OES, respectively. ***Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates*** The strengths of the exposure estimates are as follows: (1) the overall quality rating of the ESD on the Chemical Industry (OECD, 2011c) is medium, (2) the assessed worker activities for the exposure scenario are frequently occuring activities of chemical industry workers and are pertinent in the case of the OES, (3) the EPA Mass Balance Inhalation Model is well described and the underlying scientific and computational basis of this model is robust, (4) all data that the Agency used to inform the modeling parameter distributions have overall data quality ratings of either high or medium, and (5) exposure concentrations were calculated via Monte Carlo simulation from model input data that are variable. Input data variation increases the likelihood that the calculated exposure concentrations encompass the true occupational inhalation exposure concentrations. The major limitation is uncertainty about the calculated fugitive emission rates because of uncertainty about the number of operating days. Another limitation is uncertainty as to the representativeness of the model parameter distributions because these data are not specific to sites that use DIBP. In general, the effects of these uncertainties on the exposure estimates are unknown, as the uncertainties may result in either overestimation or underestimation of exposures depending on the actual distributions of each of the model input parameters. There is uncertainty in the

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	representativeness of modeled exposures towards the true distribution of potential exposures. These estimates are likely conservative because of the conservative assumption that a single worker does all worker activities during a single shift. ***Weight of Scientific Evidence Conclusion*** EPA has moderate confidence in the assessed exposures for average adult workers and females of reproductive age based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths are related to the assessed worker activities, the mathematical model of the assessment calculations, the systematic review overall quality ratings of the values of the parameters of the mathematical model, and the Monte Carlo computations which are related to model input data variation. The limitations are the uncertainties related to the accuracies of the DIBP vapor generation rate and the values of the parameters of the mathematical model. There is uncertainty in the assessed exposures, but these exposures are likely conservative because of the conservative assumption that a single worker does all worker activities during a single shift. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Repackaging Incorporation into adhesives and sealants Incorporation into paints and coatings Use as a catalyst – formulation into pre-catalyst Use of laboratory chemicals – liquids	***Summary of the Assessment Method*** EPA assessed inhalation exposure to vapor to be equal to surrogate manufacturing exposure concentrations. These surrogate exposure concentrations from the manufacturing OES are upper-bound exposures because these concentrations exceed the concentrations that the Agency would have calculated via mathematical modeling in the case of this OES. According to the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w), releases associated with each of the five OESs include DIBP fugitive emissions that are vapor emissions only. EPA did not conduct mathematical modeling involving the rates of these emissions to estimate exposure concentrations because the Agency determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case worker inhalation exposure as discussed in Appendix D.14 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). EPA received inhalation monitoring submissions from W.R. Grace (2025a) and LyondellBasell (2025b) that measured airborne concentrations of DIBP in facilities that use DIBP in pre-catalyst formulation. However, 54 out of the 56 data measurements provided by W.R. Grace and LyondellBasell were below the LOD. The LODs for the full-shift PBZ inhalation monitoring measurements ranged from 1.3×10^{-2} to 2.9×10^{-2} mg/m^3, and the two detectable values from the LyondellBasell (2025b) monitoring study were measured as 2.4×10^{-2} and 2.5×10^{-2} mg/m^3. EPA followed the *Guidelines for Statistical Analysis of Occupational Exposure Data* (U.S. EPA, 1994a) to estimate the monitoring values below the LOD and determined that the central tendency estimates of calculated with the EPA/OPPT Mass Balance Inhalation Model (*i.e.*, 4.0×10^{-3} mg/m^3) was comparable to those derived with the monitoring data. In addition, two reported values from the LyondellBasell (2025b) monitoring study (*i.e.*, 2.4×10^{-2} and 2.5×10^{-2} mg/m^3) are comparable to the high-end vapor concentration obtained from the EPA/OPPT Mass Balance Inhalation Model (*i.e.*, 1.8×10^{-2} mg/m^3). Therefore, the use of the vapor generation model described above to estimate exposure for this OES is justified. EPA assumed exposure duration is equal to 8 hours per day in the case of each of these OESs because the surrogate exposure concentrations are 8-hour TWA concentrations. The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 5 OESs are in the range of 208 to 250 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	worker or are equal to the number of operating days that EPA assessed in the case of an OES. In some cases, EPA assessed the central tendency and high-end exposure frequency to be equal. Section 3 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) contains a complete discussion of the exposure frequencies of each of the OESs. ***Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates*** The strength of the exposure estimates is EPA's high confidence that the surrogate inhalation exposure concentrations are upper-bound exposure estimates for these OESs. This is supported by inhalation monitoring studies submitted by W.R. Grace (2025a) and LyondellBasell (2025b) which measured full-shift PBZ air concentrations of DIBP in processing facilities, and the results of the study were in strong agreement with the modeled estimates of worker inhalation exposure. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration. ***Weight of Scientific Evidence Conclusion*** EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Use as a catalyst – intermediate in polypropylene manufacturing Plastic compounding Plastic converting Rubber manufacturing – rubber compounding Rubber manufacturing – rubber converting	***Summary of the Assessment Method*** Each of these 7 OESs involve fugitive emissions of DIBP vapor, fugitive emissions of dust that contains DIBP and various worker activities that are related to these fugitive emissions as discussed in Section 3 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). In the case of exposure to DIBP vapor, EPA estimated the inhalation exposure concentrations of all workers associated with these OESs to be equal to surrogate exposure concentrations. In the case of exposure to dust that contains DIBP, the Agency estimated the inhalation exposure concentrations of all workers associated with these OESs in accordance with PNOR Model. EPA assessed inhalation exposure to vapor to be equal to surrogate manufacturing exposure concentrations. These surrogate exposure concentrations from the manufacturing OES are upper-bound exposures because these concentrations exceed the concentrations that the Agency would have calculated via mathematical modeling in the case of this OES. That is, EPA determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case worker inhalation exposure concentrations as discussed in Appendix D.14 of *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). For inhalation exposure to dust that contains DIBP, EPA calculated inhalation exposure concentrations as the product of the following two factors: (1) central tendency and high-end worker monitoring data that are inhalation exposure concentrations in the case of worker exposure to respirable dust at sites associated with certain NAICS codes and (2) the concentration of DIBP in products. These respirable dust inhalation exposure concentrations are a part of the PNOR Model and are derived from OSHA CEHD data (OSHA, 2020), which was rated high for data quality via systematic review. These are not DIBP worker monitoring data, and the chemical composition of the dust may not have been reported by OSHA. The worker monitoring data of the PNOR Model that are respirable dust inhalation exposure concentrations are classified by NAICS codes. In the case of each of the 7 OESs, EPA selected the monitoring data that are associated with a NAICS code that EPA deemed to be the most appropriate. These NAICS codes are as follows: NAICS code 325 (Chemical Manufacturing) in the cases of use as a

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Recyling Waste handling, treatment, and disposal	catalyst – intermediate in polypropylene manufacturing, plastic compounding, and rubber manufacturing – rubber compounding and converting; NAICS code 326 (Plastics and Rubber Products Manufacturing) in the case of plastic converting; NAICS code 56 (Administrative and Support and Waste Management and Remediation Services) in the case of recycling and waste handling, treatment, and disposal. EPA assessed the mass concentration of DIBP in solid material containing DIBP in the case of each of the 7 OESs to be equal to the following concentration data that were generally rated high for data quality via systematic review: • Use as a catalyst – intermediate in polypropylene manufacturing: the highest expected concentration of DIBP in polypropylene manufacturing based on industry data (W.R. Grace & Company, 2022); • Plastic compounding and Plastic converting: the highest expected concentration of DIBP in plastics based on data about DIBP content in different types of plastic materials (Danish EPA, 2011); • Rubber manufacturing – rubber converting compounding and Waste handling, treatment, and disposal: industry data reported in the Emission Scenario Document on Additives in Rubber Industry and Generic Scenario on Use of Additives in Plastic Compounding (U.S. EPA, 2021e; OECD, 2004); • Recycling: industry data reported in the Emission Scenario Document on Additives in Rubber Industry and in the Generic Scenario on Use of Additives in Plastic Compounding (U.S. EPA, 2021e; OECD, 2004). EPA conservatively assumed all workers of these OESs are exposed to vapor and to dust during a single shift. Therefore, EPA assessed the central tendency and high-end 8-hour TWA inhalation exposure concentrations of each of the 7 OESs by aggregating the surrogate DIBP vapor inhalation exposure concentrations and the DIBP dust inhalation exposure concentration that EPA calculated in accordance with the PNOR Model; this aggregation is described in Appendix B of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 7 OESs are in the range of 219 to 234 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a worker or are equal to the number of operating days that EPA assessed in the case of an OES. In some cases, EPA assessed the central tendency and high-end exposure frequency to be equal. ***Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates*** The strengths of the exposure estimates are the following: (a) the overall quality ratings of the cited references are high, (b) the surrogate dust inhalation exposure concentrations are derived from a large number of monitoring data that are related to the industries that the OESs are associated with, (c) the adjustment of the dust inhalation exposure concentrations based on estimates of the concentration of DIBP in products, (d) the surrogate vapor exposure concentrations are calculated from DIBP fugitive vapor release rates that are conservative relative to the DIBP fugitive vapor release rates expected for these OESs. The limitations of the exposure estimates are exposure concentrations that are surrogate data and uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is whether the assessed exposures represent the true distribution of potential exposures. The assessed vapor exposure concentrations are likely overestimates as discussed above.

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	Weight of Scientific Evidence Conclusion EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths are the systematic review overall quality ratings of the data sources that are related to the assessed exposures, and the methods for estimation of the inhalation exposure concentrations, which are surrogate data. The limitations are the surrogate inhalation exposure data and uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is whether the assessed exposures represent the true distribution of potential exposures. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Application of adhesives and sealants Application of paints and coatings	***Summary of the Assessment Method*** In the cases of spray application of adhesives and spray application of paints and coatings, EPA estimated DIBP inhalation exposure concentrations in accordance with the Automotive Refinishing Spray Coating Mist Inhalation Model of the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a). Specifically, EPA calculated concentrations of DIBP in mist that workers are potentially exposed to via inhalation from the following factors: (1) the worker monitoring data reported in this ESD, (2) concentrations of DIBP in products as reported in SDSs and product data sheets of 28 adhesive and sealant products that contain DIBP in the case of the Application of adhesives and sealants OES and 3 paints and coatings products that contain DIBP in the case of the Application of the paints and coatings OES and, (3) the concentration of nonvolatile material in auto refinishing spray paint or coating products as reported in this ESD. The worker monitoring data that are reported in this ESD are concentrations of mist that workers are potentially exposed to during spray painting at auto refinishing shops and therefore these are surrogate monitoring data. In the case of non-spray application of adhesives and sealants and paints and coatings, EPA expects worker inhalation exposure to result from fugitive emissions of DIBP vapor. Accordingly, EPA assessed DIBP inhalation exposure concentrations by equating these concentrations to the exposure concentrations that EPA assessed in the case of the Manufacturing OES. The exposure concentrations that EPA assessed in the case of the manufacturing OES are upper-bound exposures for these OES because the Agency determined that the DIBP fugitive emissions of the Manufacturing OES result in the worst-case of worker inhalation exposure to DIBP vapor as discussed in Appendix D.14 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). EPA assessed the same exposure duration and frequency for the spray and non-spray scenarios in the case of both OESs. The Agency assumed the duration of worker exposure is 8 hours per day in the case of both OESs. To determine exposure frequency and the OES of Application of adhesives and sealants, EPA assessed the central tendency and high-end values of exposure frequency to be equal to 232 days/year and 250 days/year, respectively. This central tendency value is based on the central tendency value of the number of release days and this high-end value is the maximum number of days per year that the Agency expects a worker to work. In the case of the OES of Application of paints and coatings, EPA assessed both the central tendency and high-end values of exposure frequency to be equal to 250 days/year, which the maximum number of days per year that the Agency expects a worker to work.

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Application of adhesives and sealants Application of paints and coatings	***Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates of Spray Application*** The strengths of the exposure estimates in the case of the spray application of products, both adhesives and sealants, and paints and coatings, are as follows: (a) the mathematical model of the calculations of inhalation exposure concentrations (*i.e.*, the Automotive Refinishing Spray Coating Mist Inhalation Model) is a model that is related to the assessed scenarios, (b) the overall quality rating of the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a) is medium, and (c) exposure concentrations were estimated from concentrations of DIBP in pertinent products as reported in the SDSs or product data sheets of these products; there is an exception to this strength because of one of the paints and coatings products as discussed below under limitations. A limitation of the spray application exposure estimates in general is that the mathematical model of the calculations of inhalation exposure concentrations (*i.e.*, the Automotive Refinishing Spray Coating Mist Inhalation Model) incorporates worker mist inhalation exposure monitoring data that are unrelated to DIBP. These are worker monitoring data that pertain to worker exposure to mist during auto refinishing; whether these data represent the concentrations of mist that workers would potentially be exposed to during spray application of adhesives products and paints and coatings products that contain DIBP is uncertain. Another limitation related to the mathematical model is that EPA is uncertain whether the concentrations of nonvolatile material that the Agency incorporated into the assessment represent the concentrations of nonvolatile material in the adhesive products and the paints and coatings products that contain DIBP that would be spray applied. A discussion of other limitations follows. Within the spray application scenario of adhesives and sealants, a limitation of the exposure estimates is uncertainty about whether adhesive products containing DIBP are spray applied. EPA did not infer spray coating as the application method of any of the 28 adhesive or sealant products that are listed in Appendix E of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). However, spray application of adhesives in vehicle manufacturing is possible (OECD, 2015a) and DIBP is used in vehicle manufacturing (U.S. EPA, 2020c). Therefore, EPA assumed that workers may spray apply adhesives that contain DIBP. EPA did not assess spray application of sealant products. In contrast to the case of adhesives and sealants, EPA did infer spray coating as the application method of some of the paints or coatings products that are listed in Appendix E of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). However, a limitation of the exposure assessment approach is that EPA classified a certain product that contains DIBP at a concentration of 30–60% by weight as a paint or coating product but EPA is uncertain of this classification because this product may actually be an adhesive product. Excepting this product, the maximum concentration of DIBP in paint or coating products is 5% by weight according to Appendix E of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). EPA assessed the duration of exposure to mist that results from spray application of adhesive and paint and coating products that contain DIBP to be equal to a full 8-hour work shift, but this duration may be lower if workers are involved in other activities. The duration of spray application of adhesive products may be variable depending on the job site. EPA assessed 232 to 250 days of exposure per year based on workers applying adhesives on every working day, however, application sites may use DIBP-containing adhesives at much lower frequencies. The uncertainties discussed above decrease the weight of evidence.

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	Strengths, Limitations, and Uncertainties with the Exposure Estimates of Non-Spray Application The strength of the exposure estimates is EPA's high confidence that the surrogate inhalation exposure concentrations serve as an upper bound for potential worker exposure. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration. ***Weight of Scientific Evidence Conclusions in the Case of Spray Application of Products*** EPA's confidence in the assessed inhalation exposures is moderate based on the strengths, limitations, and uncertainties that are discussed above. In summary, the strengths of the exposure estimates in general are the mathematical model that is related to the assessed scenarios and, with one exception, the input variables of this model (*i.e.*, the concentrations of DIBP in products), which are DIBP-specific. This exception is the maximum concentration of DIBP in paints and coatings which is uncertain. The limitations of the exposure estimates are that the mist concentration data are not DIBP-specific and that an 8-hour exposure duration may be conservative in some instances. Lastly, EPA has slight to moderate confidence in the assessed central tendency inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures. ***Weight of Scientific Evidence Conclusions in the Case of Non-Spray Application of Products*** The strength of the exposure estimates is EPA's high confidence that the surrogate inhalation exposure concentrations serve as an upper bound for potential worker exposure. The major limitation is uncertainty in the assessed exposure frequency. The exposure estimates are likely conservative because of the conservative estimate of exposure concentration. Therefore, EPA has moderate confidence in the assessed inhalation exposure levels for non-spray applications.
Use of laboratory chemicals – solids Fabrication and final use of products or articles	***Summary of the Assessment Method*** Each of these 2 OESs includes fugitive emissions of dust that contains DIBP as discussed in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). Accordingly, EPA assessed inhalation exposure concentrations in accordance with the PNOR Model. Specifically, EPA calculated inhalation exposure concentration as the product of the following 2 factors: (1) central tendency and high-end worker monitoring data that are inhalation exposure concentrations in the case of worker exposure to respirable dust at sites associated with certain NAICS codes and (2) the concentration of DIBP in products. These worker monitoring data on respirable dust are a part of the PNOR Model, are derived from OSHA CEHD data (OSHA, 2020), and were rated high for data quality via systematic review. The worker monitoring data of the PNOR Model that are respirable dust inhalation exposure concentrations are classified by NAICS codes. In the case of each of the 2 OESs, EPA selected the monitoring data that are associated with the NAICS code that EPA deemed to be the most appropriate. These NAICS codes are as follows: NAICS code 54 (Professional, Scientific, and Technical Services) in the case of use of laboratory chemicals – solids and NAICS code 337 (Furniture and Related Product Manufacturing) in the case of fabrication and final use of products or articles. EPA assessed the mass concentration of DIBP in solid material containing DIBP in the case of each of the 2 OESs to be equal to the following concentration data which were generally rated high for data quality via systematic review: • Use of laboratory chemicals – solids: data reported in SDSs;

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Use of laboratory chemicals – solids Fabrication and final use of products or articles	• Fabrication and final use of products or articles: industry data provided by the Emission Scenario Document on Additives in Rubber Industry and Generic Scenario on Use of Additives in Plastic Compounding, (U.S. EPA, 2021e; OECD, 2004). EPA assessed exposure duration to be 8 hours per day in the case of each of the 2 OESs because the worker monitoring inhalation exposure concentrations are 8-hour TWA concentrations. The exposure frequencies that EPA assessed differ moderately depending on the OES. The central tendency exposure frequencies of the 2 OESs are in the range of 219 to 250 days/year and the high-end exposure frequency is generally 250 days/year. All of these values are equal to estimates of the maximum number of workdays per year of a worker or are equal to the number of operating days that EPA assessed in the case of an OES. In the case of the OES of fabrication and final use of products or articles, EPA assessed the central tendency and high-end exposure frequency to be equal. ***Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates*** The strengths of the exposure estimates are the following: (a) the overall quality ratings of the cited references are high, and (b) the dust inhalation exposure concentrations are derived from a large number of monitoring data that are related to the industries that the OESs are associated with, and (c) the adjustment of the dust inhalation exposure concentrations based on estimates of the concentration of DIBP in products. The limitations of the exposure estimates are as follows: (a) the assessment of exposure concentrations that are equal to or are based on surrogate exposure concentrations and (b) uncertainty in the assessed exposure frequency. The uncertainty associated with the exposure estimates is the uncertainty of whether the assessed exposures represent the true distribution of potential exposures. ***Weight of Scientific Evidence Conclusion*** EPA's confidence in the assessed exposures for average adult workers and females of reproductive age is moderate based on the strengths, limitations, and uncertainties that are discussed above. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs since it was assumed that ONU exposures are equal to worker central tendency exposures.
Dermal – Liquids	***Assessment Summary and Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates*** Dermal exposure to DIBP was assessed by EPA from dermal absorptive flux, surface area, exposure duration and exposure frequency. There was only one study identified that measured the flux of DIBP, but the study was conducted with *in vivo* experiments using rat specimens only (Elsisi et al., 1989). It was determined that use of the *in vivo* rat data would result in an overestimate of dermal absorption in humans. However, DIBP and DBP are isomers with similar physical chemical properties and similar absorption profiles in rats (Elsisi et al., 1989), and it is expected that dermal absorption data for DBP serve as suitable surrogate data for DIBP since the two chemicals are isomers with similar physical-chemical properties and similar rates of dermal absorption in live rats (Elsisi et al., 1989). Therefore, for estimating dermal absorptive flux of DIBP from liquid materials, EPA used surrogate absorption data from a study that measured dermal absorption of DBP in metabolically active human skin (Beydon et al., 2010). Specifically, the steady-state absorptive flux of DBP reported in Beydon et al. (2010) was used as surrogate to estimate the dermal uptake of DIBP from occupational exposures to the chemical. The selected study has many strengths, such as the use of metabolically active human skin, compliance with OECD 428 guidelines, similarities to *in vivo* human data presented in Hopf et al. (2024), similarities to values obtained from aqueous absorption modeling, and moderate rating by the EPA's systematic review process. The Beydon et al. (2010)

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
Dermal – Liquids	study is limited in that it only examined absorption of the neat material, and it is known that flux may be dependent on concentration and vehicle of absorption. Dilute materials may absorb at a faster rate but with lower concentration, and neat materials may absorb at a slower rate but with higher concentration. Therefore, there is uncertainty regarding the resulting effects of concentration and vehicle of absorption for DIBP. Regarding surface area of dermal exposure to workers handling DIBP, EPA assumed the high-end exposure surface area was equivalent to mean values for two-hand surface area (*i.e.*, 1070 cm^2 for male workers and 890 cm^2 for female workers) and the central tendency surface area was equivalent to only a single hand (or one side of two hands) (*i.e.*, 535 cm^2 for male workers and 445 cm^2 for female workers). Regarding surface area of dermal exposure to ONUs experiencing incidental contact to mist deposited on surfaces, EPA assumed a representative exposure surface area equivalent to the mean value for one palm (*i.e.*, 268 cm^2) of adult males (U.S. EPA, 2011a). Though surface areas related to hands and palms seem representative for handling of chemicals and contact with contaminated surfaces, exposure surface area may vary depending on task and scenario. There is high confidence in the surface area measurements presented in the exposure factors handbook (U.S. EPA, 2011a) but moderate confidence in the application of the surface area measurements to the occupational dermal exposure assessment of workers. Since the extent of dermal exposure to ONUs is unknown, there is greater uncertainty regarding the surface area of exposure to ONUs. Regarding duration of dermal absorption of DIBP, it was assumed that a worker may contact DIBP multiple times throughout a workday and that the material can remain on the skin until washed. Therefore, the duration of absorption was assumed as 8 hours (U.S. EPA, 1991) for estimating both central tendency and high-end exposures for all workers. It is important to note that EPA did not assume that the worker handles the chemical for 8 hours, but that a substance with low volatility contacted multiple times per workday may exist on the skin surface for 8 hours. There is moderate confidence that an absorption duration of 8 hours is representative of potential occupational dermal exposures to DIBP. However, the duration may be more or less than 8 hours depending on worker tasks and scenario. Regarding exposure frequency, it is assumed that the number of operating days is equal to the number of exposure days. Though it is possible that a worker may be exposed each working day, there is uncertainty in worker exposure frequency due to variations in worker responsibilities. Therefore, EPA has moderate confidence that the number of operating days for a given OES are representative of potential worker exposure frequencies to DIBP. However, ONUs are not likely to experience dermal contact daily, though incidental contact with a contaminated surface may occur on an acute basis. Therefore, there is greater uncertainty that the number of operating days is representative of potential ONU exposure frequencies to DIBP. ***Weight of the Scientific Evidence Conclusion*** The main strength of the assessment approach is the incorporation of the empirical *ex vivo* human skin absorption data of Beydon et al. (2010) into the assessment. The absorption study used metabolically active skin and received a moderate rating by EPA's systematic review process. However, EPA noted uncertainties in the dermal exposure assessment related to surface area, duration of absorption, and exposure frequency. Further, there is increased uncertainty regarding the extent and frequency of dermal exposures to

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	ONUs. Therefore, EPA has moderate confidence in dermal exposure estimates for workers handling liquid DIBP, and there is slight to moderate confidence in dermal exposure estimates for ONUs contacting mist deposited on surfaces.
Dermal – Solids	*Assessment Summary and Strengths, Limitations, and Uncertainties Associated with the Exposure Estimates* Dermal exposure to DIBP was assessed by EPA from dermal absorptive flux, surface area, exposure duration and exposure frequency. It is expected that dermal exposure to solid matrices would result in far less absorption than contact with liquid materials, but there are no studies that report dermal absorption of DIBP from a solid matrix. For cases of dermal absorption of DIBP from a solid matrix, EPA assumed that DIBP will first migrate from the solid matrix to a thin layer of moisture on the skin surface. Therefore, absorption of DIBP from solid matrices is considered limited by aqueous solubility and is estimated using an aqueous absorption model (U.S. EPA, 2023b, 2004). Nevertheless, it is assumed that absorption of the aqueous material serves as a reasonable upper bound for contact with solid materials. Also, EPA acknowledges that variations in chemical concentration and co-formulant components affect the rate of dermal absorption. Regarding surface area of dermal exposure to workers handling DIBP, EPA assumed the high-end exposure surface area was equivalent to mean values for two-hand surface area (*i.e.*, 1070 cm^2 for male workers and 890 cm^2 for female workers) and the central tendency surface area was equivalent to only a single hand (or one side of two hands) (*i.e.*, 535 cm^2 for male workers and 445 cm^2 for female workers). Regarding surface area of dermal exposure to ONUs experiencing incidental contact to dust deposited on surfaces, EPA assumed a representative exposure surface area equivalent to the mean value for one palm (*i.e.*, 268 cm^2) of adult males (U.S. EPA, 2011a). Though surface areas related to hands and palms seem representative for handling of chemicals and contact with contaminated surfaces, exposure surface area may vary depending on task and scenario. There is high confidence in the surface area measurements presented in the exposure factors handbook (U.S. EPA, 2011a) but moderate confidence in the application of the surface area measurements to the occupational dermal exposure assessment of workers. Since the extent of dermal exposure to ONUs is unknown, there is greater uncertainty regarding the surface area of exposure to ONUs. Regarding duration of dermal absorption of DIBP, it was assumed that a worker may contact DIBP multiple times throughout a workday and that the material can remain on the skin until washed. Therefore, the duration of absorption was assumed as 8 hours (U.S. EPA, 1991) for estimating both central tendency and high-end exposures for all workers. It is important to note that EPA did not assume that the worker handles the chemical for 8 hours, but that a substance with low volatility contacted multiple times per workday may exist on the skin surface for 8 hours. There is moderate confidence that an absorption duration of 8 hours is representative of potential occupational dermal exposures to DIBP. However, the duration may be more or less than 8 hours depending on worker tasks and scenario. Regarding exposure frequency, it is assumed that the number of operating days is equal to the number of exposure days. Though it is possible that a worker may be exposed each working day, there is uncertainty in worker exposure frequency due to variations in worker responsibilities. Therefore, EPA has moderate confidence that the number of operating days for a given OES are representative of potential worker exposure frequencies to DIBP. However, ONUs are not likely to experience dermal contact daily, though

OES(s)	Summary of Assessment Methodology and Discussion of Weight of Scientific Evidence Conclusion in Occupational Exposures
	incidental contact with a contaminated surface may occur on an acute basis. Therefore, there is greater uncertainty that the number of operating days is representative of potential ONU exposure frequencies to DIBP. *Weight of the Scientific Evidence Conclusion* The main strength of the assessment approach is the assumption that dermal uptake from solid materials is limited by aqueous solubility, and EPA has high confidence that the modeling of aqueous absorption of DIBP serves as an upper bound of dermal uptake from contact with solid materials. However, EPA noted uncertainties in the dermal exposure assessment related to surface area, duration of absorption, and exposure frequency. Further, there is increased uncertainty regarding the extent and frequency of dermal exposures to ONUs. Therefore, EPA has moderate confidence in dermal exposure estimates for workers handling solid materials containing DIBP, and there is slight to moderate confidence in dermal exposure estimates for ONUs contacting dust deposited on surfaces.

4.1.2 Consumer Exposures

The following subsections briefly describe EPA's approach to assessing consumer exposures and provide exposure assessment results for each COU. The *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025e) provides additional details on the development of approaches and the exposure assessment results. The consumer exposure assessment evaluated exposures from individual COUs while the indoor dust assessment uses a subset of consumer articles with large surface area and presence in indoor environments to garner COU-specific contributions to the total exposures from dust.

4.1.2.1 Summary of Consumer and Indoor Dust Exposure Scenarios and Modeling Approach and Methodology

The main steps in performing a consumer exposure assessment are summarized below:

- Identification and mapping of product and article examples following the consumer COU table (Table 1-1), product, and article identification.
- Compilation of products and articles manufacturing use instructions to determine patterns of use.
- Selection of exposure routes and exposed populations according to product/article use descriptions.
- Identification of data gaps and further search to fill gaps with studies, chemical surrogates or product and article proxies, or professional judgement.
- Selection of appropriate modeling tools based on available information and chemical properties.
- Gathering of input parameters per exposure scenario.
- Parameterization of selected modeling tools.

Consumer products or articles containing DIBP were matched with the identified consumer COUs. Table 4-6 summarizes the consumer exposure scenarios by COU for each product example(s), the exposure routes, which scenarios are also used in the indoor dust assessment, and whether the analysis was conducted qualitatively or quantitatively, see Sections 2.2.1 and 2.2.2 in (U.S. EPA, 2025e) for detailed descriptions, explanations, and rationale. The indoor dust assessment uses consumer products and articles information for selected items with the goal of recreating the indoor environment. The subset of consumer products and articles that are used in the indoor dust assessment are selected for their potential to have large surface area for dust collection, roughly larger than 1 m^2.

When a quantitative analysis of reasonably available information was conducted, exposure from the consumer COUs was estimated by modeling. Exposure via inhalation and ingestion routes were modeled using EPA's Consumer Exposure Model (CEM), Version 3.2 (U.S. EPA, 2023b), see Section 4.1.2.1.1 for description of approaches and methodology. Dermal exposures for both liquid products and solid articles were calculated using a flux-limited dermal absorption approach for liquid and solid products, see *Consumer Exposure Analysis for DIBP* (U.S. EPA, 2025f) for calculations and inputs and Section 4.1.2.1.2 for description of approaches and methodology (U.S. EPA, 2025e). For each exposure route assessed and for various modeling input parameters (*e.g.,* weight fractions, duration use), EPA used the 10th percentile, average, and 95th percentile value of an input parameter (*e.g.*, weight fraction, surface area) where possible to characterize low, medium, and high intensity use exposure scenarios for a given COU. If only a range was reported, EPA used the minimum and maximum of the range as the low and high values, respectively. The average of the reported low and high values from the reported range was used for the medium exposure scenario. See *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025e) for details about the consumer modeling approaches, sources of data, model parameterization, and assumptions. High, medium, and low intensity use exposure scenarios serve as a two-pronged approach. First, it provides a sensitivity analysis with insight on the impact of the main modeling input parameters (*e.g.*, skin contact area, duration of contact, and frequency of contact) in the doses and risk estimates. And second, the high intensity use exposure scenarios are used first to screen for potential risks at the upper bound of possible exposures, and to refine if needed.

Exposure via the inhalation route occurs from inhalation of DIBP gas-phase emissions or when DIBP partitions to suspended particulate from direct use or application of products. However, DIBP's low volatility is expected to result in negligible gas-phase inhalation exposures. Sorption to suspended and settled dust is likely to occur based on monitoring data (see indoor dust monitoring data in Section 4.1.2.1) and its affinity for organic matter that is typically present in household dust. Thus, inhalation and ingestion of suspended and settled dust is considered in this assessment. Exposure via the dermal route can occur from direct contact with products and articles. Exposure via ingestion depends on the product or article use patterns. Exposure can occur via direct mouthing (*i.e.*, directly putting product in mouth) in which the person can ingest settled dust with DIBP, or directly ingesting DIBP from migration to saliva. Additionally, ingestion of suspended dust can occur when DIBP migrates from article to dust or partitions from gas-phase to suspended dust.

EPA made some adjustments to match CEM's life stages to those listed in CDC guidelines (CDC, 2021) and EPA's *A Framework for Assessing Health Risks of Exposures to Children* (U.S. EPA, 2006). CEM life stages are re-labeled from this point forward as follows:

- Adult (21+ years) → Adults
- Youth 2 (16–20 years) → Teenagers
- Youth 1 (11–15 years) → Young teens
- Child 2 (6–10 years) → Middle childhood
- Child 1 (3–5 years) → Preschoolers
- Infant 2 (1–2 years) → Toddlers
- Infant 1 (<1 year) → Infants

EPA assessed acute, intermediate, and chronic exposures to DIBP from consumer COUs. For the acute dose rate calculations, an averaging time of 1 day is used representing the maximum time-integrated dose over a 24-hour period during the exposure event. The chronic dose rate is calculated iteratively at a 30-second interval during the first 24 hours and every hour after that for 60 days and averaged over 1 year. Intermediate dose is the exposure to continuous or intermittent (depending on product) use during a 30-day period, roughly one month. See Sections 2.2.1 and 2.2.2 and Appendix A in (U.S. EPA, 2025c) for details about acute, chronic, and intermediate dose calculations. Professional judgment and product use descriptions were used to estimate events per day and per month/year for the calculation of the intermediate/chronic dose.

Table 4-6. Summary of Consumer COUs, Exposure Scenarios, and Exposure Routes

Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route[a]	Evaluated Routes				
						Ingestion		
				Inhalation[b]	Dermal	Suspended Dust	Settled Dust	Mouthing
Adhesives and sealants	Adhesives and sealants	Wood flooring adhesive	Use of product in DIY large-scale home repair activities. Direct contact during use; inhalation of emissions during use	**QT**	**QT**	*QL*	*QL*	*QL*
Adhesives and sealants	Adhesives and sealants	Concrete and masonry adhesive adhesives for small repairs	Use of product in DIY small-scale home repair activities. Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*
Adhesives and sealants	Adhesives and sealants	Small projects with seaming adhesive and a fire caulk	Use of product in DIY home repair activities. Direct contact during use; inhalation of emissions during use	**QT**	**QT**	*QL*	*QL*	*QL*
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Indoor furniture	Direct contact during use; inhalation of emissions/ingestion of airborne particulate; ingestion by mouthing	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	**QT**
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Children's clothing	Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Clothing synthetic leather for teenagers and adults	Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Articles with semi-routine contact. Variety PVC articles: bags, belts, headband accessories, and steering wheel cover	Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*
Fabric, textile, and leather products not covered elsewhere	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Footwear components	Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*

Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route[a]	Evaluated Routes				
						Ingestion		
				Inhalation[b]	Dermal	Suspended Dust	Settled Dust	Mouthing
Floor coverings	Floor coverings	Vinyl flooring	Direct contact, inhalation of emissions / ingestion of dust adsorbed chemical	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Floor coverings	Floor coverings	Carpet tiles	Direct contact, inhalation of emissions / ingestion of dust adsorbed chemical	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Paints and coatings	Paints and coatings	Articles with semi-routine contact; paint	Direct contact during use	*QL*	**QT**	*QL*	*QL*	*QL*
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Air beds	Direct contact during use, inhalation of emissions / ingestion of dust adsorbed chemical while in place	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Car mats	Direct contact during use. See routine contact scenario inhalation of emissions / ingestion of dust adsorbed chemical	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Wallpaper	Direct contact during installation (teenagers and adults) and while in place; inhalation of emissions / ingestion of dust adsorbed chemical	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Shower curtain	Direct contact during use. See routine contact scenario inhalation of emissions / ingestion of dust adsorbed chemical while hanging in place	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	*QL*
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Articles with semi-routine contact. Tires and variety PVC articles: bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard	Direct contact during use	*QL*	**QT**	QL	QL	QL

Consumer COU Category	Consumer COU Subcategory	Product/Article	Exposure Scenario and Route[a]	Evaluated Routes				
						Ingestion		
				Inhalation[b]	Dermal	Suspended Dust	Settled Dust	Mouthing
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Children's toys (legacy). produced after CFR regulatory limitations, 0.1%.	Collection of toys. Direct contact during use; inhalation of emissions / ingestion of airborne particulate; ingestion by mouthing	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	**QT**
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	children's toys (new). produced after CFR regulatory limitations, 0.1%.	Collection of toys. Direct contact during use; inhalation of emissions / ingestion of airborne PM; ingestion by mouthing	**QT**[c]	**QT**	**QT**[c]	**QT**[c]	**QT**
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Tire crumb, artificial turf	Direct contact during use (particle ingestion via hand-to-mouth)	**QT**	**QT**	**QT**[d]		
Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Articles with semi-routine contact. Variety PVC articles: diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	Direct contact during use	QL	**QT**	QL	QL	QL
Disposal	Disposal	Down the drain products and articles	Down the drain and releases to environmental media	*QL*	*QL*	*QL*	*QL*	*QL*
Disposal	Disposal	Residential end-of-life disposal, product demolition for disposal	Product and article end-of-life disposal and product demolition for disposal	*QL*	*QL*	*QL*	*QL*	*QL*

CFR = Code of Federal Regulations [16 CFR 1307.3(b)]. DIY– do-it-yourself; *QL* = qualitative analysis; **QT** = quantitative analysis
In accordance with section 108(b)(3) of the Consumer Product Safety Improvement Act of 2008 (CPSIA), 16 CFR 1307.3(b) prohibits any children's toy or childcare article that contains concentrations >0.1% of DIBP as of July 2018. Section 108(b)(3) of the CPSIA 2008 requires the CPSC to promulgate a final rule regarding certain phthalates in children's toys and childcare articles. This rule must be issued within 180 days of receiving a final report from the Chronic Hazard Advisory Panel (CHAP), which was published in July 2014.
[a] See Sections 2.2.1 and 2.2.2 in (U.S. EPA, 2025d) for details about exposure scenarios per COU and product example and exposure routes assessed quantitatively and qualitatively.
[b] Inhalation scenarios considered suspended dust and gas-phase emissions.
[c] These indoor dust articles scenarios consider the surface area from multiple articles such as toys, while furniture and flooring already have large surface areas. For these articles dust can deposit and contribute to significantly larger concentration of dust than single small articles
[d] The tire crumb and artificial turf ingestion route assessment considers all 3 types of ingestions, settled dust, suspended dust, and mouthing altogether, but results cannot be provided separately has it was done for all other articles and products.

4.1.2.1.1 Inhalation and Ingestion Exposure Routes Modeling Approaches

Key parameters for articles modeled in CEM Version 3.2 are summarized in detail in Section 2 in *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025d). Calculations, sources, input parameters and results are also available in *Consumer Exposure Analysis for DIBP* (U.S. EPA, 2025e). Generally, and when possible, model parameters were determined based on specific articles identified in this assessment and CEM defaults were only used where specific information was not available. A list of some of the most important input parameters in developing representative scenarios for the selected modeling tools and approaches for exposure from articles and products is included below. Of these, the chemical migration rate from articles to saliva and area mouthed are most important parameters for mouthing exposure scenarios. Duration, frequency and amount used have been determined to be key determinants of estimated exposure concentrations according to a sensitivity analysis conducted for CEM input parameters Consumer Exposure Model (CEM), Version 3.2 (U.S. EPA, 2023b).

- weight fraction (articles and products);
- density (articles and products);
- duration of use (products);
- frequency of use for chronic, acute, and intermediate (products);
- product mass used (products);
- article surface area (articles);
- chemical migration rate to saliva (articles);
- area mouthed (articles); and
- use environment volume (articles and products).

For each scenario, high-, medium-, and low-intensity use exposure scenarios were developed in which values for duration of use, frequency of use, and surface area were determined based on reasonably available information or professional judgment. Each input parameter listed above was parameterized according to the article-specific data found via systematic review. If article-specific data were not available, CEM default parameters were used, or if CEM default parameters were not applicable, an assumption based on article use descriptions by manufacturers was used, always leaning on the health protective values. For example, for all scenarios, the near-field modeling option was selected to account for a small personal breathing zone around the user during product use in which concentrations are higher, rather than employing a single well-mixed room. This represents a conservative modeling assumption in the absence of article-specific emission data. A near-field volume of 1 m^3 was selected. See Section 2.1 for weight fraction selection and Section 2.2.3 for parameterization details in the *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025e).

4.1.2.1.2 Dermal Exposure Routes Modeling Approaches

See U.S. EPA (2025e) for more details about DIBP dermal exposures to liquid and solid consumer products and articles. See *Consumer Exposure Analysis for DIBP* (U.S. EPA, 2025f) for DIBP dermal exposure calculations and inputs. EPA assumes that the rate of transport of DIBP across the dermal barrier is considered flux limited. Briefly, the physical and chemical properties of DIBP (high molecular weight, large size, and low solubility in water) impede its ability to cross the dermal barrier. Dermal flux values were modeled for solid articles and extracted from Beydon et al. (2010) for liquid products. For liquid products, since DIBP and DBP are isomers, and the two isomers share very similar physical-chemical properties (*i.e.*, identical molecular weights and very similar octanol-water partition coefficients), it is expected that the difference in permeability for human skin exhibited by DBP is also relevant for DIBP. The rate of dermal absorption of DBP in human skin samples was measured as 5.9×10^{-4} mg/cm^2/h by Beydon et al. (2010), and EPA determined that this rate of absorption is the most reasonable data to characterize the rate of dermal absorption of DIBP in humans. For solid articles, EPA first estimated the aqueous permeability coefficient using CEM equations. Next, EPA relied on Equation 3.2 and 3.3 from the Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, (Part E: Supplemental Guidance for Dermal Risk Assessment) (U.S. EPA, 2004) which characterizes dermal uptake for aqueous organic compounds. Specifically, Equation 3.2 and 3.3 from U.S. EPA (2004), were used to estimate the dermally absorbed dose (DA_{event}, mg/cm^2) for an absorption event occurring over a defined duration based upon product use (see *Consumer Exposure Analysis for DIBP* (U.S. EPA, 2025f) for details).

See Section 4.1.2.4 for discussion on limitations, strengths, and confidence of this approach. For each product or article, high-, medium-, and low-intensity use exposure scenarios were developed. Values for duration of dermal contact and area of exposed skin were determined based on the reasonably expected use for each item. Key parameters for the dermal model are shown in Section 2.3 in U.S. EPA (2025e).

4.1.2.2 Modeling Dose Results by COU for Consumer

This section summarizes the dose estimates from inhalation, ingestion, and dermal exposure to DIBP in consumer products and articles. Detailed tables of the dose results for acute, intermediate, and chronic exposures are available in the *Consumer Risk Calculator for DIBP* (U.S. EPA, 2025g). Modeling dose results for acute, intermediate, and chronic exposures and data patterns are described in Section 3 in the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e).

For teens and young adults (11–20 years), and adults (21+ years), dermal contact was a strong driver of exposure to DIBP from consumer products and articles, with the dose received being generally higher than or similar to the dose received from exposure via inhalation or ingestion. The largest dose estimated is for acute and chronic dermal exposure to synthetic leather furniture for all life stages. Among the younger life stages (infant to 11 years), the pattern was less clear as these ages were not designated as product users and therefore not modeled for dermal contact with any of the liquid products assessed. Key differences in exposures among life stages include designation as a product user or bystander, behavioral differences such as hand-to-mouth contact times and time spent on the floor, and dermal contact expected from touching specific articles that may not be appropriate for some life stages.

4.1.2.3 Indoor Dust Assessment

PVC products and articles that contain DIBP are ubiquitous in modern indoor environments, and DIBP can partition, migrate, or evaporate (to a lesser extent based on physical and chemical properties) into indoor air and concentrate in household dust. See Sections 4.1 and 4.2 of the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e) for a summary of indoor dust monitoring data that EPA used to establish the presence of DIBP in indoor dust in the residential environment. Exposure to DIBP through dust ingestion, dust inhalation, and dermal absorption is a particular concern for young children between the ages of 6 months and 2 years, as they crawl on the ground and pull up on ledges, which increases hand-to-dust contact, and place their hands and objects in their mouths. Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area (exceeding ~1 m^2) for either a single article or collection of like articles as appropriate. In a screening assessment, EPA considered the aggregation of chronic dust ingestion doses, see Section 4.3 in in the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e). The highest dose was for preschoolers aged 3 to 5 years.

Articles in the indoor assessment included the following:

- furniture components (textiles);
- carpet tiles;

- vinyl flooring;
- air beds;
- car mats;
- shower curtains;
- in-place wallpaper;
- children's toys, both legacy and new; and
- tire crumb.

4.1.2.4 Weight of Scientific Evidence Conclusions for Consumer Exposure

Key sources of uncertainty for evaluating exposure to DIBP in consumer goods and strategies to address those uncertainties are described in detail in Section 5.1 of the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e). Generally, designation of robust confidence suggests that the supporting scientific evidence weighted against the uncertainties is adequate to characterize exposure assessments. The supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the exposure estimate. The designation of moderate confidence suggests that the supporting evidence weighed against the uncertainties is reasonably adequate to characterize exposure assessments. The designation of slight confidence is assigned when the weight of scientific evidence may (1) not be adequate to characterize the scenario, and (2) in the absence of complete information and there are additional uncertainties that may need to be considered. The designation of slight to moderate confidence suggests that some aspects of the analysis are reasonably adequate but other aspects are not adequate or well understood to characterize the exposure. The overall confidence to use the results for risk characterization ranges from moderate to robust, depending on COU scenario. The basis for the moderate to robust confidence in the overall exposure estimates reflects a balance between using parameters that will represent various populations' use patterns and emphasizing conservative assumptions that are not excessive or unreasonable.

The exposure assessment of chemicals from consumer products and articles has inherent challenges due to many sources of uncertainty in the analysis, including variations in product formulation, patterns of consumer use, frequency, duration, and application methods. Variability in environmental conditions might also alter physical and/or chemical behavior of the product or article. Table 4-7 summarizes the overall confidence per COU and a discussion of rationale used to assign the overall confidence. The subsections ahead of the table describe sources of uncertainty for several parameters used in consumer exposure modeling that apply across COUs and provide an in depth understanding of sources of uncertainty and limitations and strengths within the analysis. The confidence to use the results for risk characterization ranges from moderate to robust.

Product Formulation and Composition

Variability in the formulation of consumer products, including changes in ingredients, concentrations, and chemical forms, can introduce uncertainty in exposure assessments. However, EPA reduced uncertainty by using reported concentrations from product-specific SDSs. EPA obtained DIBP weight fractions in various products and articles from material SDSs, databases, and existing literature. A large amount of data were available for DIBP in consumer goods published across several studies conducted by the Danish EPA (Danish EPA, 2020). EPA used the Danish EPA information under the assumption that the weight fractions reported by the Danish EPA are representative of DIBP content that could be present in items sold in the United States. Where possible, the Agency obtained multiple values for weight fractions for similar products or articles. The lowest value was used in the low exposure scenario, the highest value in the high exposure scenario, and the average of all values in the medium exposure scenario. EPA decreased uncertainty in exposure and subsequent risk estimates in the high-, medium-, and low-intensity use scenarios by capturing the weight fraction variability and obtaining a better characterization of the products and articles varying composition within one COU. Overall weight fraction confidence is *moderate* for products/articles with multiple sources but insufficient description on how the concentrations were obtained, *robust* for products/articles with more than one source, and *slight* for articles with only one source with unconfirmed content or little understanding on how the information was produced.

Product Use Patterns

Consumer use patterns such as frequency of use, duration of use, methods of application, and skin contact area are expected to differ. Where possible, high, medium, and low default values from CEM Version 3.2's prepopulated scenarios were selected for mass of product used, duration of use, and frequency of use. In instances where no prepopulated scenario was appropriate for a specific product, low, medium, and high values for each of these parameters were estimated based on the manufacturers' product descriptions. EPA decreased uncertainty by selecting use pattern inputs that represent product and article use descriptions and furthermore capture the range of possible use patterns in the high- to low-intensity use scenarios. Exposure and risk estimates are considered representative of product use patterns and well characterized. The overall confidence is rated *robust* for most product use patterns.

Article Use Patterns

For articles, inhalation and ingestion exposures for the high, medium, and low intensity use scenarios, default values from CEM Version 3.2's prepopulated scenarios were selected for indoor use environment/room volume, interzone ventilation, and surface layer thickness. For articles dermal exposures use patterns such as duration and frequency of use and skin contact area are expected to have a range of low to high use intensities. For articles, which do not use duration of use as an input in CEM, professional judgment was used to select the duration of use/article contact duration for the low, medium, and high exposure scenario levels for most articles except for carpet tiles and vinyl flooring. Carpet tiles and vinyl flooring contact duration values were taken from EPA's Standard Operating Procedures for Residential Pesticide Exposure Assessment for the high exposure level (2 hours; time spent on floor surfaces) (U.S. EPA, 2012b), ConsExpo (U.S. EPA, 2012b) for the medium exposure level (1 hour; time a child spends crawling on treated floor), and professional judgment for the low exposure level (0.5 hour). There are more uncertainties in the assumptions and professional judgment for contact duration inputs for articles, and hence EPA has *moderate* confidence in those inputs.

Article Surface Area

The surface area of an article directly affects the potential for DIBP emissions to the environment. For each article modeled for inhalation exposure, low, medium, and high estimates for surface area were calculated (Section 2 in (U.S. EPA, 2025e)). This approach relied on manufacturer-provided dimensions where possible, or values from EPA's *Exposure Factors Handbook* for floor and wall coverings. For small items that might be expected to be present in a home in significant quantities, such as children's toys, aggregate values were calculated for the cumulative surface area for each type of article in the indoor environment. Overall confidence in surface area is *robust* for articles like furniture, wall coverings, flooring, toys, and shower curtains because there is a good understanding of the presence and dimensions in indoor environments.

Human Behavior

CEM Version 3.2 has three different activity patterns: stay-at-home, part-time out-of-the home (daycare, school, or work), and full-time out-of-the-home. The activity patterns were developed based on the Consolidated Human Activity Database (CHAD). For all products and articles modeled, the stay-at-home activity pattern was chosen as it is the most protective assumption.

Mouthing durations are a source of uncertainty in human behavior. The data used in this assessment are based on a study in which parents observed children (n = 236) ages 1 month to 5 years of age for 15 minutes per sessions and 20 sessions in total (Smith and Norris, 2003). There was considerable variability in the data due to behavioral differences among children of the same life stage. For instance, while children aged 6 to 9 months had the highest average mouthing duration for toys at 39 minutes per day, the minimum duration was 0 minutes and the maximum was 227 minutes per day. The observers noted that the items mouthed were made of plastic roughly 50 percent of the mouthing time, but this was not limited to soft plastic items likely to contain significant plasticizer content. In another study, 169 children aged 3 months to 3 years were monitored by trained observers for 12 sessions at 12 minutes each (Greene, 2002). They reported mean mouthing durations ranging from 0.8 to 1.3 minutes per day for soft plastic toys and 3.8 to 4.4 minutes per day for other soft plastic objects (except pacifiers). Thus, it is likely that the mouthing durations used in this assessment (*e.g.*, 39.2 min/day for high intensity use for toys or infants <1, see Table 2-6 in U.S. EPA (2025e)) provide a health protective estimate for mouthing of soft plastic items likely to contain DIBP. EPA assigned a *moderate* confidence associated with mouthing estimates duration of activity because the magnitude of the overestimation is not well characterized. All other human behavior parameters are well defined and understood, or the ranges used capture use patterns representative of various life stages, which results in a *robust* confidence in use patterns.

Inhalation and Ingestion Modeling Tool

Confidence in the model used considers whether the model has been peer reviewed, as well as whether it is being applied in a manner appropriate to its design and objective. The model used, CEM Version 3.2, has been peer reviewed (ERG, 2016), is publicly available, and has been applied in the manner intended by estimating exposures associated with uses of household products and/or articles. This also considers the default values data source(s) such as building and room volumes, interzonal ventilation rates, and air exchange rates. Overall confidence in the proper use of CEM for consumer exposure modeling is *robust*.

Dermal Modeling for DIBP Exposure for Liquids

Experimental dermal data were identified via the systematic review process to characterize consumer dermal exposures to liquids or mixtures and formulations containing DIBP, see Sections 2.3.1 and 2.3.2 in U.S. EPA (2025e).

EPA identified only one set of experimental data related to the dermal absorption of neat DIBP (Elsisi et al., 1989). This dermal absorption study was conducted *in vivo* using male F344 rats. There have been additional studies conducted to determine the difference in dermal absorption between rat skin and human skin. Specifically, Scott (1987) examined the difference in dermal absorption between rat skin and human skin for four different phthalates (*i.e.*, DMP, DEP, DBP, and DIBP) using *in vitro* dermal absorption testing. Results from the *in vitro* dermal absorption experiments showed that rat skin was more permeable than human skin for all four phthalates examined. Since DIBP and DBP are isomers, and the two isomers share very similar physical-chemical properties (*i.e.*, identical molecular weights and very similar octanol-water partition coefficients), EPA determined that DBP is an appropriate dermal absorption surrogate for DIBP. Therefore, the steady-state dermal flux values from the Beydon et al. (2010) *ex vivo* study using metabolically active human skin samples for DBP are used for calculation of dermal doses due to exposure to liquid DIBP. The Agency thus assumes that the difference in permeability between rat skin and human skin for DBP is also relevant for DIBP. The Beydon *et al*. (2010) study shows that fluxes of DBP through animal skin are significantly higher than human skin. EPA is confident that the DBP *ex vivo* human dermal absorption data from Beydon *et al*. (2010) provides a representative estimate for dermal absorption of DIBP for liquid products.

The Beydon et al. (2010) study is limited in that it only examined absorption of the neat material, and it is known that flux may be dependent on concentration and vehicle of absorption. Dilute materials may absorb at a faster rate but with lower concentration, and neat materials may absorb at a slower rate but with higher concentration. Therefore, there is uncertainty regarding the resulting effects of concentration and vehicle of absorption for DIBP.

A source of uncertainty regarding the dermal absorption of DIBP from products or formulations stems from the varying concentrations and co-formulants that exist in products or formulations containing DIBP. For purposes of this risk evaluation, EPA assumes that the absorptive flux of neat DIBP measured from *ex vivo* human experiments for the absorptive flux of aqueous DIBP is representative of absorptive flux of chemical into and through the skin for dermal contact with all liquid products. However, dermal contact with products or formulations that have lower concentrations of DIBP may exhibit lower rates of flux since there is less material available for absorption. Conversely, co-formulants or materials within the products or formulations may lead to enhanced dermal absorption, even at lower concentrations. Therefore, it is uncertain whether the products or formulations containing DIBP would result in decreased or increased dermal absorption. Based on the available dermal absorption data for DIBP, EPA has made assumptions that result in exposure assessments that are the most representative of expected exposures while leaning on conservative approaches.

Dermal Modeling of DBP Exposure for Solids

Experimental dermal data like migration or emission rates or dermal loading were not identified via the systematic review process to estimate dermal exposures to solid products or articles containing DIBP and a modeling approach was used to estimate exposures, see Section 2.3.3 in U.S. EPA (2025e). EPA notes that there is uncertainty with respect to the modeling of dermal absorption of DIBP from solid matrices or articles. Because there were no available data related to the dermal absorption of DIBP from solid matrices or articles, the Agency has assumed that dermal absorption of DIBP from solid objects would be limited by aqueous solubility of DIBP. It is expected that dermal exposure to solid matrices would result in far less absorption than contact with liquid materials, but there are no studies that report dermal absorption of DIBP from a solid matrix. For cases of dermal absorption of DIBP from a solid matrix, EPA assumed that DIBP will first migrate from the solid matrix to a thin layer of moisture on the skin surface. Therefore, absorption of DIBP from solid matrices is considered limited by aqueous solubility and is estimated using an aqueous absorption model. To determine the maximum steady-state aqueous flux of DIBP, EPA utilized CEM (U.S. EPA, 2023b) to first estimate the steady-state aqueous permeability coefficient of DIBP. The estimation of the steady-state aqueous permeability coefficient within CEM (U.S. EPA, 2023b) is based on a quantitative structure-activity relationship (QSAR) model presented by ten Berge (2009), which considers chemicals with $\log(K_{ow})$ ranging from −3.70 to 5.49 and molecular weights ranging from 18 to 584.6. The molecular weight (278.35 g/mol) and $\log(K_{ow})$ (4.34) of DIBP falls within the range suggested by ten Berge (2009). Therefore, there is medium uncertainty regarding the accuracy of the QSAR model used to predict the steady-state aqueous permeability coefficient for DIBP. There are some uncertainties on the assumption of migration from solid to aqueous media to skin, which assumes the aqueous dermal exposure model absorbs as a saturated aqueous solution (*i.e.,* concentration of absorption is equal to water solubility), which would be the maximum concentration of absorption of DIBP expected from a solid material. EPA has *moderate* confidence in the dermal exposure to solid products or articles modeling approach.

Ingestion Via Mouthing

Very little data were available for migration rates of DIBP from solid articles to saliva, and no data were found with weight fractions of DIBP similar to those reported for the articles assessed here (< 2% DIBP by weight). The weight fraction range used in this assessment for the articles evaluated for mouthing—

specifically the two children's toys' scenarios—are significantly below the range considered for the empirical chemical migration data for other phthalates. A theoretical framework based on physical and chemical properties of DIBP and the solid matrix material was used to estimate chemical migration rates, in the absence of adequate empirical data. This model was internally and externally validated against measured diffusion coefficients and shown to have good predictive capability for chemicals with molecular weights between 30 and 1,178 g/mol at temperatures between 4 and 180 °C (Aurisano et al., 2022), which are well within DIBP properties and temperatures during product use.

Major limitations of the chemical migration rate estimate calculation approach are that there is no understanding of the correlation between concentration of DIBP in consumer products and the calculated chemical migration rate, and there is no available data to compare the estimated chemical rate value. These limitations result in a significant level of uncertainty for the estimated chemical migration rate, as the value may also differ among similar items due to variations in chemical makeup and polymer structure. Thus, it is unclear whether the migration rate value is applicable to consumer goods with low weight fractions of DIBP. EPA has a *slight* confidence in the chemical migration rate value in the context of this assessment consumer product considerations and a *slight* confidence in the overall modeling approach even when considering the moderate confidence in the mouthing durations and other modeling inputs. Note that overall confidence in ingestion exposures considers the aggregation of ingestion of suspended dust, settled dust, and if applicable to the scenario, ingestion via mouthing. Confidence in dust ingestion was moderate.

Table 4-7. Weight of Scientific Evidence Summary Per Consumer COU

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
Adhesives and sealants; Adhesives and sealants	Three different scenarios were assessed under this COU for three product types with differing use patterns: Wood flooring adhesives, concrete and masonry adhesives for small repairs, and small projects with seaming adhesive and a fire caulk. Of these 3 scenarios, concrete and masonry adhesives were assessed for dermal exposures only because these products are used outdoors, where the potential for inhalation and ingestion exposure is low. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025e) for number of products, product examples, and weight fraction data. For dermal exposure EPA used a dermal flux approach, which was estimated based on DIBP *ex vivo* dermal absorption in humans. The main strength of the assessment approach is the incorporation of the empirical *ex vivo* human skin absorption data of Beydon et al. (2010) into the assessment. The Beydon et al. (2010) study is a DBP dermal absorption study which EPA determined to be an appropriate surrogate for DIBP dermal absorption based on similar physical and chemical properties between DBP and DIBP. While EPA is confident that DBP is an appropriate DIBP surrogate, using DBP dermal absorption as a surrogate for DIBP adds uncertainty. The absorption study used metabolically active skin, received a moderate rating by EPA's systematic review process, and is supported by multiple streams of evidence. The Beydon et al. (2010) study is limited in that it only examined absorption of the neat material, and it is known that flux may be dependent on concentration and vehicle of absorption. Dilute materials may absorb at a faster rate but with lower concentration, and neat materials may absorb at a slower rate but with higher concentration. Therefore, there is uncertainty regarding the resulting effects of concentration and vehicle of absorption for DIBP. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in a moderate overall confidence.	Inhalation – Robust Dermal – Moderate
Fabric, textile, and leather products not covered elsewhere; Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Five different scenarios were assessed under this COU for articles with differing use patterns: Indoor furniture and textiles; Children's clothing; Synthetic leather clothing for teenagers and adults; Variety of PVC articles with routine contact; and Footwear components. Indoor furniture articles were assessed for all exposure routes (inhalation, ingestion [suspended and settled dust, and mouthing], and dermal) as part of the indoor exposure assessment while the other scenarios were only assessed for dermal contact because the articles were too small to result in significant inhalation and ingestion exposures. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025e) for number of products, product examples, and weight fraction data. The indoor furniture ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates, and no reasonably available data to compare and	Inhalation – Robust Ingestion – Moderate Dermal – Moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
	confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. EPA is confident that the modeling approach provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use as well as surface area in contact are well understood and representative, resulting in an overall confidence of moderate.	
Floor coverings; Floor coverings	Two different scenarios were assessed under this COU for articles with differing use patterns. The scenarios of vinyl flooring and carpet tiles were evaluated. Both scenarios were part of the indoor assessment and evaluated for all exposure routes except mouthing. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025e) for number of products, product examples, and weight fraction data. Ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates, and no reasonably available data to compare and confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. EPA is confident that the modeling approach provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of moderate.	Inhalation – Robust Dust Ingestion – Moderate Dermal – Moderate
Paints and coatings; Paints and coatings	One scenario was assessed for this COU, paints. The scenario was assessed for dermal exposures during application and direct dermal contact because inhalation and ingestion exposures were determined to be minimal due to small amount of product used and potential small surface area to release DIBP.	Dermal – Moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
	For dermal exposure EPA used a dermal flux approach, which was estimated based on DIBP *ex vivo* dermal absorption in humans. The main strength of the assessment approach is the incorporation of the empirical *ex vivo* human skin absorption data of Beydon et al. (2010) into the assessment. The Beydon et al. (2010) study is a DBP dermal absorption study which EPA determined to be an appropriate surrogate for DIBP dermal absorption based on similar physical and chemical properties between DBP and DIBP. While EPA is confident that DBP is an appropriate DIBP surrogate, using DBP dermal absorption as a surrogate for DIBP adds uncertainty. The absorption study used metabolically active skin, received a moderate rating by EPA's systematic review process, and is supported by multiple streams of evidence. The Beydon et al. (2010) study is limited in that it only examined absorption of the neat material, and it is known that flux may be dependent on concentration and vehicle of absorption. Dilute materials may absorb at a faster rate but with lower concentration, and neat materials may absorb at a slower rate but with higher concentration. Therefore, there is uncertainty regarding the resulting effects of concentration and vehicle of absorption for DIBP. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in a moderate overall confidence.	
Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Seven different scenarios were assessed under this COU for articles with differing use patterns: air beds, car mats, in-place wallpaper, wallpaper installation, shower curtains, tire crumb and artificial turf, and variety PVC articles with routine contact (multiple examples). Air beds, car mats, in-place wallpaper, and shower curtains scenarios were considered in the indoor assessment for all exposure routes except mouthing, while wallpaper installation was assessed for dermal and inhalation for age groups above 10 years and just inhalation for age groups under 10 years of age as bystanders of the installation process. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025e) for number of products, product examples, and weight fraction data. Ingestion exposure estimate overall confidence is moderate due to uncertainties in the parameters used for chemical migration to saliva. For example, unknown correlation between chemical concentration in articles and chemical migration rates as well as no reasonably available data to compare and confirm selected rate parameters to understand uncertainties. However, the ingestion modeling approach was validated against measured diffusion coefficients and shown to have good predictive capabilities for chemicals with DIBP's molecular weight. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. EPA is confident that the modeling approach	Inhalation – Robust Ingestion – Moderate Dermal – Moderate

Consumer COU Category and Subcategory	Weight of Scientific Evidence	Overall Confidence
	provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of moderate.	
Toys, playground, and sporting equipment; Toys, playground, and sporting equipment	Four different scenarios were assessed under this COU for various articles with differing use patterns: legacy children's toys, new children's toys, tire crumb and artificial turf, and a variety of PVC articles with potential for routine contact. Toy scenarios were included in the indoor assessment for all exposure routes (inhalation, dust ingestion, mouthing, and dermal) with varying use patterns and inputs. Tire crumb was also part of the indoor assessment for all exposure routes except mouthing. Articles of semi-routine contact were only assessed for dermal exposures since they are too small to result in impactful inhalation or ingestion exposures. The high-, medium-, and low-intensity scenarios capture variability and provide a range of representative use patterns. The overall confidence in this COU's inhalation exposure estimate is robust because the CEM default parameters represent actual use patterns and location of use. See Section 2.1.2 in U.S. EPA (2025e) for location of use, number of products, product examples, and weight fraction data. Tire crumb inhalation confidence is moderate due to higher uncertainty in using surrogate chemical air concentrations, while all other parameters are well understood and representative of use patterns by the various age groups. The overall confidence in this COU's mouthing and dermal exposure assessment is moderate. The mouthing parameters used like duration and surface area for infants to children are very well understood, while older groups have less specific information because mouthing behavior is not expected. The chemical migration rate value is DIBP specific, and the main sources of uncertainty are related to article formulation and chemical migration dynamics. Migration of the chemical to saliva may not be very well characterized, but by assessing high-, medium-, and low-intensity use exposure scenarios EPA increases confidence in the estimates by using representative scenarios. The dermal absorption estimate assumes that dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP. EPA has moderate confidence in the exposure estimate for solid articles because of the high uncertainty in the assumption of partitioning from solid to liquid, and because subsequent dermal absorption is not well characterized. EPA is confident that the modeling approach provides an upper-bound of dermal absorption of DIBP for solid articles. Other parameters such as frequency and duration of use, and surface area in contact, are well understood and representative, resulting in an overall confidence of moderate.	CEM Inhalation – Robust Ingestion, Tire Crumb Inhalation, – Moderate Dermal – Moderate

4.1.3 General Population Exposures

General population exposures occur when DIBP is released into the environment and the environmental media becomes a pathway for exposure. As described in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) and summarized in Table 4-8 of this assessment, releases of DIBP are expected to occur to air, water, and land. Figure 4-1 provides a graphical representation of where and in which media DIBP is estimated to be found due to environmental releases and the corresponding route of exposure.

EPA began its DIBP general population exposure assessment using a screening level approach because of limited environmental monitoring data for DIBP and lack of location data for DIBP releases. A screening level analysis relies on conservative assumptions, including default input parameters for modeling exposure, to assess exposures that would be expected to be on the high-end of the expected exposure distribution. Details on the use of screening level analyses in exposure assessment can be found in EPA's *Guidelines for Human Exposure Assessment* (U.S. EPA, 2019c).

EPA evaluated the reasonably available information for releases of DIBP from facilities that use, manufacture, or process DIBP under industrial and/or commercial COUs subject to TSCA regulations detailed in the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). As described in Section 3.3, using the release data, EPA modeled concentrations of DIBP in surface water, sediment, drinking water, and ambient air in the United States. Table 3-8 summarizes the high-end DIBP concentrations in environmental media from environmental releases. The reason for assessing different pathways qualitatively or quantitatively is discussed briefly in Section 3.3, and additional detail can be found in *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v).

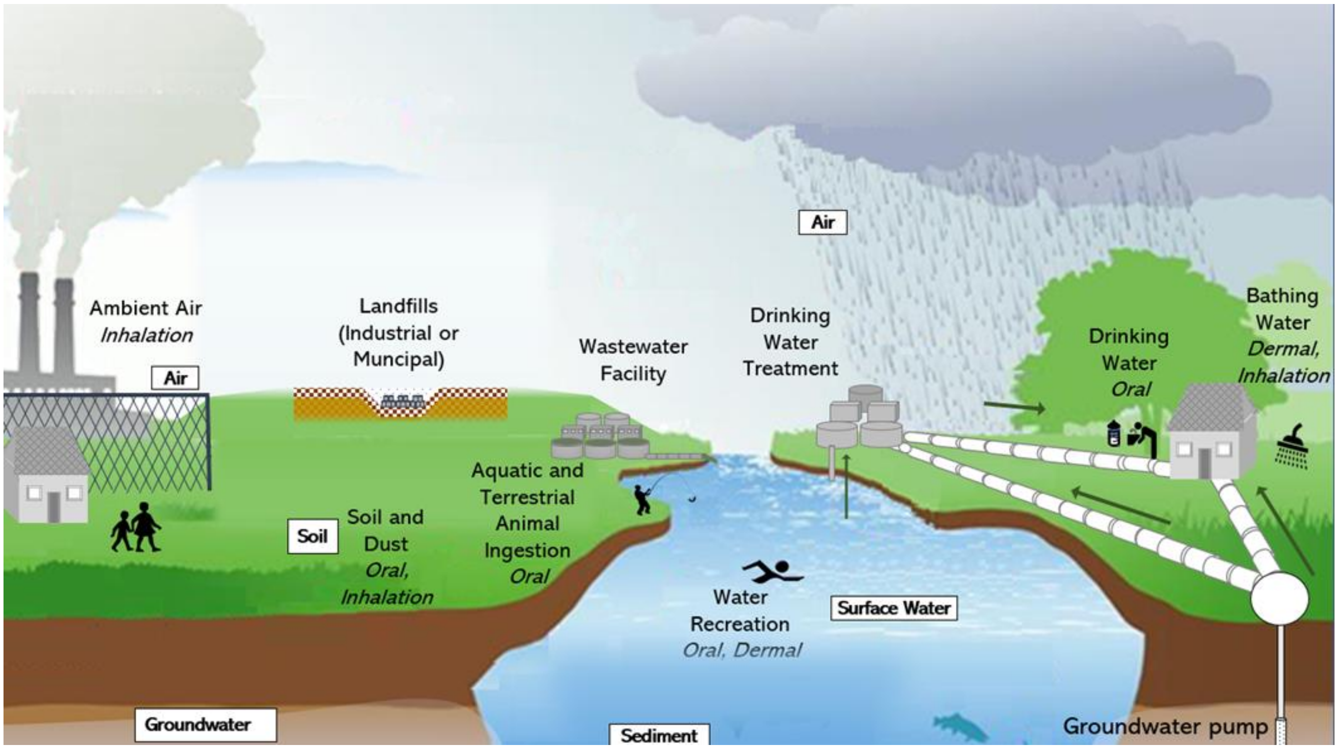

Figure 4-1. Potential Human Exposure Pathways to DIBP for the General Population

High-end estimates of DIBP concentration in the various environmental media presented in Table 3-8 and in the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v) were used for screening level purposes in the general population exposure assessment. EPA's *Guidelines for Human Exposure Assessment* (U.S. EPA, 2019c) defines high-end exposure estimates as a "plausible estimate of individual exposure for those individuals at the upper end of an exposure distribution, the intent of which is to convey an estimate of exposure in the upper range of the distribution while avoiding estimates that are beyond the true distribution." If risk is not found for these individuals with high-end exposure, no risk is anticipated for central tendency exposures, which is defined as "an estimate of individuals in the middle of the distribution." Therefore, if there is no risk for an individual identified as having the potential for the highest exposure associated with a COU for a given pathway of exposure, then that pathway was determined not to be a pathway of concern and not pursued further. If any pathways were identified as a pathway of concern for the general population, further exposure assessments for that pathway would be conducted to include higher tiers of modeling when available, refinement of exposure estimates, and exposure estimates for additional subpopulations and OES/COUs.

Identifying individuals at the upper end of an exposure distribution included consideration of high-end exposure scenarios defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations. As described in Section 3.3, EPA focused on estimating high-end concentrations of DIBP from the largest estimated releases for the purpose of its screening level assessment for environmental and general population exposures. This means that the Agency considered the environmental concentration of DIBP in a given environmental medium resulting from the OES that had the highest release compared with all other OESs for the same releasing media. Release estimates from OES resulting in lower environmental media concentrations were not considered for this screening level assessment. Additionally, individuals with the greatest intake rate of DIBP per body weight were considered to be those at the upper-end of the exposure distribution.

Table 4-8 summarizes the high-end exposure scenarios that were considered in the screening level analysis including the life stage assessed as the most potentially exposed population based on intake rate and body weight. Table 4-8 also indicates which pathways were evaluated quantitatively or qualitatively. Exposure scenarios were assessed quantitatively only when environmental media concentrations were quantified using estimated release data for the appropriate exposure scenario. Because DIBP concentration associated with environmental releases from biosolids and landfills (and therefore, resulting soil concentrations) were not quantified, exposure from soil or groundwater resulting from DIBP release to the environment via biosolids or landfills was not quantitatively assessed. Due to the high confidence in the biodegradation rates and physical and chemical data, there is robust confidence that DIBP will not be mobile and will have low persistence potential in receiving soils. Similarly, there is robust confidence that DIBP is unlikely to be present in landfill leachates. However, the scenarios were assessed qualitatively for exposures potentially resulting from biosolids and landfills. Further details on the screening level approach and exposure scenarios evaluated by EPA for the general population are provided in the *Environmental Media, General Population, and Environmental Exposure Assessment for DIBP* (U.S. EPA, 2025v). OESs resulting in the highest modeled environmental media concentrations were selected for the purpose of screening level analyses.

Table 4-8. Exposure Scenarios Assessed in Risk Screening for DIBP

OES[a]	Exposure Pathway	Exposure Route	Exposure Scenario	Life stage[b]	Analysis (Quantitative or Qualitative)
All	Biosolids	All scenarios were assessed qualitatively			Qualitative
All	Landfills	All scenarios were assessed qualitatively			Qualitative
Application of paints and coatings	Surface water	Dermal	Dermal exposure to DIBP in surface water during swimming	Adult, youth, and children	Quantitative
		Oral	Incidental ingestion of DIBP in surface water during swimming	Adult, youth, and children	Quantitative
Application of paints and coatings	Drinking water	Oral	Ingestion of drinking water sourced from surface water	Adult, youth, and children	Quantitative
Application of paints and coatings; Plastic compounding	Fish ingestion	Oral	Ingestion of fish for general population	Adult and young toddler[c]	Quantitative
			Ingestion of fish for subsistence fishers	Adult	Quantitative
			Ingestion of fish for tribal populations	Adult	Quantitative
Plastic compounding (fugitive and stack)	Ambient air	Inhalation	Inhalation of DIBP in ambient air resulting from industrial releases	All	Quantitative
		Oral	Ingestion of soil from air to soil deposition resulting from industrial releases	Infants and Children	Quantitative

[a] Table 3-1 provides a crosswalk of industrial and commercial COUs to OESs.
[b] Adults (16+ years for fish ingestion, 20+ years for surface water), youths (11–15 years and 16–20 years), children (6–10 years), infants (birth to <1 years), toddlers (1–5 years)
[c] Adult ingestion rates are for age groups 16+ years and young toddler are for 1 to <2 years. Only these 2 age groups were evaluated because young toddlers had the highest 90th percentile ingestion rate and adults had the highest 50th percentile ingestion rate.

EPA also considered biomonitoring data, specifically urinary biomonitoring data from CDC's NHANES, to estimate exposure using reverse dosimetry (see Section 11 of EPA's *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v)). Reverse dosimetry modeling is a powerful tool for estimating exposure but does not distinguish between routes or pathways of exposure nor does it allow for source apportionment (*i.e.*, exposure from TSCA COUs cannot be isolated from non-TSCA uses). Instead, reverse dosimetry provides an estimate of the total dose (or aggregate exposure) responsible for the measured biomarker. Therefore, intake doses estimated using reverse dosimetry are not directly comparable to the exposure estimates from the various environmental media presented in this assessment. However, the total intake dose estimated from reverse dosimetry can help contextualize the exposure estimates from exposure pathways outlined in Table 4-8 as being potentially underestimated or overestimated.

4.1.3.1 General Population Screening Level Exposure Assessment Results

Land Pathway

EPA evaluated general population exposures via the land pathway (*i.e.*, application of biosolids, landfills) qualitatively. Regarding the application of biosolids, once in the soil, DIBP is expected to have a high affinity to soil (log K_{OC} = 2.67) and organic media (log K_{OW} = 4.34), which would limit mobility from biosolids or biosolid amended soils. Similarly, high sorption to particulates and organics would likely lead to high retardation, which would limit infiltration to and mobility within surrounding groundwater systems. DIBP is slightly soluble in water (6.2 mg/L) and has limited potential to leach from biosolids and infiltrate into deeper soil strata. However, it is not expected to migrate as far as groundwater given the minimum depth to groundwater required for biosolids agricultural applications stated in 40 CFR part 503. Since DIBP does have high hydrophobicity and a high affinity for soil sorption, it is unlikely that DIBP will migrate from potential biosolids-amended soils via groundwater infiltration. DIBP has been detected in surface runoff originating from landfills containing DIBP (IARC, 2013). However, the limited mobility and high sorption to soil suggests that infiltration of such stormwater runoff would be of minimal concern to deeper groundwater systems.

There are limited measured data on concentrations of DIBP in biosolids or soils receiving biosolids, and there is uncertainty that concentrations used in this analysis are representative of all types of environmental releases. However, the high-quality biodegradation rates and physical and chemical properties suggest that DIBP will have limited persistence potential and mobility in soils receiving biosolids.

Based on the biodegradation and hydrolysis data for conditions relevant to landfills, there is high confidence that DIBP will be persistent in landfills, but unlikely to be present in landfill leachates or to migrate through groundwater. However, there is currently no direct evidence that the general populus or surrounding fauna are directly exposed to DIBP through refuse or waste disposed of through landfills. Although possible, there have been no data to suggest that DIBP is present in environmental compartments adjacent to landfills as the direct result of landfill operations.

Surface Water Pathway – Incidental Ingestion and Dermal Contact from Swimming

EPA conducted modeling of releases to surface water at the point of release (*i.e.*, in the immediate water body receiving the effluent) to estimate the resulting environmental media concentrations from TSCA COUs. EPA conducted modeling with EPA's Variable Volume Water Model with Point Source Calculator tool (VVWM-PSC) to estimate concentrations of DIBP within surface water and to estimate settled sediment in the benthic region of streams. Releases associated with the Application of paints and coatings OES resulted in the highest total water column concentrations, with 30Q5 water concentrations of 1460 µg/L without wastewater treatment, and 467.2 µg/L when run under a conservative assumption of 68 percent wastewater treatment removal efficiency (Table 4-9) Because data on removal of DIBP in US wastewater treatment plants is limited, EPA selected a removal of 68 percent, which is the lower end of reported median removal of DBP, which has been reported to be 68 to 98 percent within 50 WWTPs in the United States. (U.S. EPA, 1982). While a range of wastewater removal efficiencies were identified in the literature, the value of 68 percent removal was selected as a conservative removal value for U.S. WWTPs based on the discussion and confidence presented in the *Physical Chemistry and Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag). Both treated and untreated scenarios were assessed due to uncertainty about the prevalence of wastewater treatment from discharging facilities and to demonstrate the hypothetical disparity in exposures between treated and untreated effluent in the generic release scenarios. COUs mapped to this OES are shown in Table 3-1. Although there is some uncertainty about the portion of these release estimates within this OES actually discharged to surface water, it is presented as a high-end screening analysis for general population exposure. These water column concentrations were used to estimate the acute dose rate (ADR) and average daily dose (ADD) from dermal exposure and incidental ingestion of DIBP while swimming for adults (2+ years), youths (11–15 years), and children (6–10 years). Detailed results for all exposures can be found in *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). In this section exposure scenarios leading to the highest modeled dose are shown in Table 4-9.

For the purpose of a screening level assessment, EPA used a margin of exposure (MOE) approach using high-end exposure estimates to determine if exposure pathways were pathways of concern for potential non-cancer risks. MOEs for general population exposure through dermal exposure and incidental ingestion during swimming in untreated surface water for the most exposed life stage were above the benchmark of 30 for all scenarios (Table 4-9). Based on a screening level assessment, risks for non-cancer health effects are not expected for the surface water pathway; therefore, exposures due to incidental ingestion and dermal contact from swimming through the surface water pathway is not considered to be a pathway of concern for the general population exposure to DIBP.

Surface Water Pathway – Drinking Water

For the drinking water pathway, modeled surface water concentrations were used to estimate drinking water exposures. As described in Section 2, because of its high hydrophobicity and high affinity for soil sorption, it is unlikely that DIBP will migrate from landfills via groundwater infiltration. Therefore, drinking water exposure in this assessment is focused on drinking water sourced from surface water. For screening level purposes, only the OES scenario resulting in the highest modeled surface water concentrations, Application of paints and coating, was included in the drinking water exposure analysis. COUs mapped to this OES are shown in Table 3-1. ADR and ADD values from drinking water exposure to DIBP were calculated for various age groups but the most exposed life stage, infants (birth to <1 year), is shown in Table 4-9. Detailed results for all exposures can be found in *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). In this section exposure scenarios leading to the highest modeled dose for drinking water are shown in Table 4-9, which are for acute exposures to infants.

MOEs are greater than the benchmark of 30 for nearly all scenarios. When considering untreated surface water (no wastewater or drinking water treatment), the MOE for acute drinking water exposure for infants was 28. However, it is an unlikely scenario to assume that there would be drinking water exposure to completely untreated surface water. This assessment assumed that concentrations at the point of intake for the drinking water system are equal to the concentrations in the receiving waterbody at the point of release, where treated effluent is being discharged from a facility. In reality, some distance between the point of release and a drinking water intake would be expected, providing space and time for additional reductions in water column concentrations via degradation, partitioning, and dilution. Some form of additional treatment would typically be expected for surface water at a drinking water treatment plant, including coagulation, flocculation, and sedimentation, and/or filtration. This treatment would likely result in even greater reductions in DIBP concentrations prior to releasing finished drinking water to customers. Based on the conservative modeling parameters for drinking water concentration and exposure factor parameters, risk for non-cancer health effects for drinking water ingestion is not expected.

Table 4-9. Summary of High-End General Population Surface Water and Drinking Water Exposure

OES[a]	Water Column Concentrations	Incidental Dermal Surface Water[b]		Incidental Ingestion Surface Water[c]		Drinking Water[d]	
	30Q5 Conc. (µg/L)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)	ADR (mg/kg-day)	Acute MOE (Benchmark MOE = 30)
Application of paints and coatings[a] *without wastewater treatment*	1,460	1.7E−02	334	7.81E−03	7.29E02	2.06E−01	28
Application of paints and coatings[a] *with wastewater treatment*	467.2	5.5E−03	1,043	2.50E−03	2.28E03	6.6E−02	86

30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate; MOE = margin of exposure; OES = occupational exposure scenario
[a] Table 3-1 provides a crosswalk of industrial and commercial COUs to OES. Only this OES was used in the screening assessment because it resulted in the highest surface water concentrations.
[b] Most exposed age group: adults (21+ years)
[c] Most exposed age group: youths (11–15 years)
[d] Most exposed age group: infants (birth to <1 year)

Fish Ingestion

The key parameters to estimate human exposure to DIBP via fish ingestion are the surface water concentrations, bioaccumulation factor (BAF), and fish ingestion rates. Surface water concentrations for DIBP associated with a particular COU were modeled using VVWM-PSC as described in Section 3.3.1.1. The harmonic mean flow and resulting estimated concentrations in surface water and fish tissue were applied to calculate exposure via fish ingestion because the harmonic mean flow is considered representative of long-term DIBP concentrations that would enter fish tissue over time. The details on the BAF, which considers the animal's uptake of a chemical from both diet and the water column, can be found in Section 7 of the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). Despite a low BAF, EPA considered fish ingestion exposure to the general population because of large estimated releases to water.

EPA evaluated exposure and potential risk to DIBP through fish ingestion for populations and age groups that had the highest fish ingestion rate per kg of body weight—including for adults and young toddlers in the general population, adult subsistence fishers, and adult Tribal populations. Children were not considered for reasons explained in Sections 7.2 and 7.3 of the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). Only the fish ingestion rate changes for these different populations; the surface water concentration and BAF remain the same. ADR and ADD values from fish ingestion exposure to DIBP were calculated for all populations and multiple age groups (U.S. EPA, 2025v), but Table 4-10 shows only the scenarios for Tribal populations as they represent the highest exposure because of their elevated fish ingestion rates compared to the general population and subsistence fisher populations. Exposure to Tribal populations were estimated based on a current mean (U.S. EPA, 2011a) and current 95th percentile (Polissar et al., 2016) fish ingestion rate. Current ingestion rate refers to the present-day consumption levels that are suppressed by contamination, degradation, or loss of access. Heritage rates existed prior to non-indigenous settlement on Tribal fishers' resources and changes to culture and lifeways. Therefore, current ingestion rates are considered more representative of contemporary rates of fish consumption and are presented below. Heritage rates are discussed in further detail in the *Environmental Media, General Population, and Environmental*

Exposure for DIBP (U.S. EPA, 2025v).

For the screening level analysis, EPA used DIBP's water solubility as an upper limit of DIBP concentration in surface water to estimate DIBP concentration in fish tissue. Conservative exposure estimates based on the water solubility limit resulted in screening level risk estimates below the benchmark. Therefore, EPA refined its evaluation by using modeled surface water concentrations for Application of paints and coatings (highest among OESs discharging to multiple media types) and Plastic compounding (highest among OESs discharging to water only). For both OESs, the concentrations correspond to the harmonic mean based on the highest modeled 95th percentile release without consideration of wastewater treatment. The more refined exposure estimates did not result in risk estimates below the benchmark except for one scenario. The MOE was 18 at the 95th ingestion rate for Application of paints and coatings at the P50 flow rate. However, EPA has only slight confidence in this result. The generic scenario used to estimate the environmental releases associated with this OES does not proportion what fraction, if any, is discharged to surface water. EPA assumed all is discharged to surface water in its screening-level assessment and unable to refine its analysis because of the low confidence and high uncertainty inherent in assuming what fraction may be discharged to surface water. Furthermore, this scenario compounded multiple conservative assumptions. It used the high-end, 95th percentile release, directed all releases to surface water without treatment, and modeled surface water concentrations to a waterbody characterized by relatively low flow (*i.e.*, P50). EPA thus does not believe such high surface water concentrations and subsequent DIBP concentrations in fish tissue are representative of real-world exposures. Lastly, for the Plastic compounding OES, no MOEs are below benchmark for any scenarios. Fish ingestion is overall not expected to be a pathway of concern for tribal populations for all OESs.

For the general population and subsistence fisher, EPA concludes that exposure to DIBP via fish ingestion is not a concern for all OESs. That includes the ones with multimedia releases where all were assumed to be discharged to surface water. MOEs exceeded the benchmark even when applying that conservative assumption (U.S. EPA, 2025a). Because MOEs were not below the benchmark for the Application of paints and coatings OES, which resulted in the highest exposure scenario, no other OES and their corresponding COUs are expected to result in risk estimates below the benchmark.

Table 4-10. Fish Ingestion for Adults in Tribal Populations Summary

Calculation Method	Current Mean Ingestion Rate (Benchmark MOE = 30)		Current 95th Percentile Ingestion Rate (Benchmark MOE = 30)	
	ADR/ADD (mg/kg-day)	Acute/Chronic MOE[a]	ADR/ADD (mg/kg-day)	Acute/Chronic MOE[a]
Water solubility limit (6.20 mg/L)	0.506	11	2.04	3
Application of paints and coatings (generic scenario for multimedia releases, HE, without wastewater treatment) 9.54E−01, 1.07E−01, 4.82E−03 mg/L for P50, P75, P90 flow	7.78E−02 (P50 flow) 8.72E−03 (P75 flow) 3.93E−04 (P90 flow)	73 (P50 flow) 653 (P75 flow) 14,503 (P90 flow)	3.14E−01 (P50 flow) 3.52E−02 (P75 flow) 1.59E−03 (P90 flow)	18 (P50 flow) 162 (P75 flow) 3,592 (P90 flow)
Plastic compounding (generic scenario for water-only release, HE, without wastewater treatment) 3.21E−01 mg/L for P50 flow	2.62E−02	218	1.06E−01	54

ADR = acute dose rate; ADD = average daily dose; MOE = margin of exposure; POD = point of departure
[a] Acute and chronic MOEs are identical because the exposure estimates and POD do not change between acute and chronic.

Ambient Air Pathway

The ambient air exposure assessment utilized a previously peer-reviewed screening level analysis to evaluate exposures to the general population in proximity to releasing facilities, including fenceline communities. The approach used is described in EPA's *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities (Version 1.0)* (U.S. EPA, 2022b).

EPA used the Integrated Indoor/Outdoor Air Calculator (IIOAC) Model to estimate the high-end (95th percentile) and mean (50th percentile) daily and annual average concentrations across the modeled distribution of DIBP concentrations in ambient air to assess general population exposures at three distances from the release point (100, 100–1,000, and 1,000 m). The daily average concentration is the average of 24 consecutive, hourly modeled concentrations within each day modeled in IIOAC across 5 years of meteorological data modeled within IIOAC as described in the IIOAC Users Guide (U.S. EPA, 2019f). The annual average is a rolling 365-day average of all daily average concentrations across 5 years of meteorological data modeled within IIOAC. EPA also modeled the high-end (95th percentile) and mean (50th percentile) rolling annual average wet, dry, and total deposition rates of DIBP from the ambient air at three distances from the releasing facility (100, 100–1,000, and 1,000 m).

EPA used the highest daily releases (stack and fugitive) across all COUs from the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w) as direct inputs to the IIOAC Model to estimate concentrations and deposition rates. The highest daily estimated releases were used to represent a high-end release value for acute, short-term exposures and risk estimates. EPA used the maximum 95th percentile modeled concentrations and deposition rates across a series of exposure scenarios considering particle size and urban/rural topography to characterize exposures and derive risk estimates. The 95th percentile values were used to capture a high-end exposure within the distribution of modeled results to better represent a peak concentration rather than a central tendency average concentration for acute exposures.

Calculations for general population exposure to ambient air via inhalation and ingestion from air to soil deposition for life stages expected to be highly exposed based on exposure factors can be found in *Ambient Air Exposure Assessment for DIBP* (U.S. EPA, 2025a). Inhalation exposure to DIBP from ambient air is expected to be much higher than exposure to DIBP via soil ingestion resulting from air to soil deposition and is, therefore, presented below for the screening level analysis.

The maximum EPA-estimated daily release value for fugitive and stack releases for DIBP was 8.82 kg/site-day and categorized under the "Plastic Compounding" OES with an unknown media of release (could be releases to air, land, water, or incineration, or any combination and could be either fugitive, stack, or any combination). Since the release type is unknown, under the methodology used, EPA assumed the entire release was either all fugitive or all stack releases for this assessment and separately models the entire release as each type. EPA recognizes taking this either/or approach to release type means the modeled concentrations are not additive (as they cannot occur at the same time). However, for this screening level assessment, the Agency assumes the releases occurred at the same time to determine an upper-bound "total exposure" to DIBP attributable to both fugitive and stack releases. Although this captures the highest release of each type possible, it may overestimate total exposure of the general population to DIBP.

The highest 95th percentile modeled daily average concentration used to derive acute non-cancer risk estimates for fugitive releases was 16.68 $\mu g/m^3$ and for stack releases was 0.91 $\mu g/m^3$. These concentrations occurred at 100 m from the releasing facility and together result in a total exposure from facility releases of 17.59 µg/m^3.

The highest 95th percentile modeled annual average concentration used to derive chronic risk estimates for fugitive releases was 15.81 µg/m^3 and for stack releases was 0.64 µg/m^3. These concentrations occurred at 100 m from the releasing facility and together result in a total exposure from facility releases of 16.45 µg/m^3.

Table 4-11 summarizes the total exposures and the associated MOE calculated using the inhalation human equivalent concentration (HEC). The HEC is derived in the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad) and is based on an 80 kg adult. Based on the 95th percentile air concentrations, MOEs for general population exposure through inhalation of ambient air are 1,762 for acute and 1,884 for chronic (compared to a benchmark of 30) for an adult. Because the HEC was derived for adults, MOEs for other life stages were not calculated. However, considering similar or smaller inhalation rates for younger life stages and greatest body weight difference of a factor of 16.7 between an adult (80 kg) and newborn (4.8 kg) based on EPA's *Exposure Factors Handbook: 2011 Edition* (U.S. EPA, 2011b), MOEs for all life stages will still exceed the benchmark based on the estimates for adults.

The risk estimates described in the preceding paragraph are derived from a highly conservative exposure scenario where such exposures to both fugitive and stack releases cannot physically occur at the same time based on assumptions made around the releases and total exposure. Even under this highly conservative exposure scenario, the derived risk estimates are well above relative benchmarks for non-cancer health effects (greater than an order of magnitude). Therefore, EPA concludes exposure to DIBP via the ambient air pathway, inhalation route is not a concern for the general population for Plastic compounding OES. Because MOEs were not below the benchmark for the Plastic compounding OES, which resulted in the highest exposure scenario, no other OES and their corresponding COUs (Table 4-11) are expected to result in risk estimates below the benchmark.

Table 4-11. Summary of High-End General Population Total Ambient Air Inhalation Exposure

OES[a]	Acute (Daily Average)[b]		Chronic (Annual Average)[b]	
	Air Concentration[c] (µg/m^3)	MOE[d]	Air Concentration[c] (µg/m^3)	MOE[d]
Plastic compounding (fugitive)	17.59	1,762	16.45	1,884
Application of paints and coatings without engineering controls (stack)				

MOE = margin of exposure; OES = occupational exposure scenario
[a] Table 3-1Provides a crosswalk of industrial and commercial COUs to OESs.
[b] EPA assumes the general population is continuously exposed (*i.e.*, 24 hours per day, 365/216 days per year) to outdoor ambient air concentrations.
[c] Air concentrations are reported for the high-end (95th percentile) modeled value at 100 m from the emitting facility and stack plus fugitive releases combined.
[d] Benchmark MOE = 30

Based on the 95th percentile total annual particle deposition rate for DIBP, the MOE for the Oral HED is 225,351,863. Again, even under this highly conservative exposure scenario, the derived risk estimate is seven orders of magnitude greater than the benchmark MOE of 30. Therefore, EPA concludes that soil ingestion resulting from air to soil deposition is not a pathway of concern for the general population.

4.1.3.2 Daily Intake Estimates for the U.S. Population Using NHANES Urinary Biomonitoring Data

EPA used a screening level approach to calculate sentinel exposures to the general population from TSCA releases. EPA also analyzed urinary biomonitoring data from the CDC's NHANES dataset to provide context for aggregate exposures in the U.S. non-institutionalized civilian population. The NHANES dataset reports urinary concentrations for 15 phthalate metabolites specific to individual phthalate diesters. EPA analyzed data for one metabolite of DIBP; mono-isobutyl phthalate (MIBP) (measured in 2001–2018 NHANES cycles). Urinary metabolite levels reported in the most recent NHANES survey (*i.e.*, 2017–2018) were used to calculate daily intake for various demographic groups reported within NHANES (Table 4-12). Median daily intake estimates across demographic groups ranged from 0.16 to 0.57 µg/kg-day, while 95th percentile daily intake estimates ranged from 0.49 to 2.12 µg/kg-day. The highest daily intake value estimated was for male toddlers (3 to <6 years) and was 2.12 µg/kg-day at the 95th exposure percentile.

Detailed results of the NHANES analysis can be found in Section 11.1 of *Environmental Media and General Population and Environmental Exposure Assessment for DIBP* (U.S. EPA, 2025v).

Using 50th and 95th percentile daily intake values calculated from reverse dosimetry, EPA calculated MOEs ranging from 10,000 to 36,000 at the 50th percentile and 2,700 to 12,000 at the 95th percentile across demographic groups using the acute/intermediate/chronic POD (*i.e.*, an HED of 5,700 µg/kg-day) based on reduced fetal testicular testosterone (Table 4-13). The lowest calculated MOE of 2,700 was for male toddlers (3 to <6 years), based on the 95th percentile exposure estimate. All calculated MOEs at the 50th and 95th percentiles were above the benchmark of 30, indicating that aggregate exposure to DIBP alone does not pose a risk to the non-institutionalized, U.S. civilian population.

General population exposure estimates calculated from exposure to ambient air, surface water, fish ingestion, and soil from TSCA releases are not directly analogous to daily intake values estimated via reverse dosimetry from NHANES. Although NHANES may be used to provide context for aggregate exposures in the U.S. population, NHANES is not expected to capture exposures from specific TSCA COUs that may result in high-dose exposure scenarios (*e.g.*, occupational exposures to workers), as compared with EPA's general population exposure assessment, which evaluates sentinel exposures for specific exposure scenarios corresponding to TSCA releases. However, as a screening level analysis, media specific general population exposure estimates calculated herein were compared to daily intake values calculated using reverse dosimetry of NHANES biomonitoring data. Comparison of the values shows that many of the exposure estimates resulting from incidental dermal contact or ingestion of surface water (assuming no wastewater treatment) (Table 4-9) and ingestion of fish for adults (Table 4-10) from sentinel exposure scenarios exceed the total daily intake values estimated using NHANES (Table 4-12).

Exposure estimates for the general population via ambient air, surface water, and drinking water resulting from TSCA releases quantified in this document are likely overestimates. This is because exposure estimates from individual pathways exceed the total intake values calculated from NHANES measured even at the 95th percentile of the U.S. population for all ages. Further, this is consistent with the U.S. CPSC's conclusion that DIBP exposure comes primarily from diet for women, infants, toddlers, and children and that the outdoor environment is not a major source of exposure to DIBP (CPSC, 2014). Thus, although the general population exposure estimates calculated using a screening level approach likely represent an overestimation of exposure, no MOEs for these sentinel exposures were below the benchmark MOE of 30, indicating no need for further refinement.

Table 4-12. Daily Intake Values and MOEs for DIBP Based on Urinary Biomonitoring from the 2017–2018 NHANES Cycle

Demographic	50th percentile Daily Intake (95% CI) (µg/kg-day)	95th percentile Daily Intake (95% CI]) (µg/kg-day)	50th Percentile MOE (Benchmark = 30)	95th Percentile MOE (Benchmark = 30)
All	0.25 (0.23–0.28)	1.16 (0.97–1.35)	23,000	4,900
Females	0.26 (0.22–0.31)	0.96 (0.77–1.15)	22,000	5,900
Males	0.25 (0.21–0.28)	1.35 (1.01–1.69)	23,000	4,200
White non-Hispanic	0.24 (0.2–0.29)	0.99 (0.74–1.23)	24,000	5,800
Black non-Hispanic	0.24 (0.2–0.29)	1.38 (1.05–1.71)	24,000	4,100
Mexican-American	0.25 (0.21–0.29)	1.13 (0.52–1.73)	23,000	5,000
Other	0.28 (0.23–0.34)	1.23 (0.83–1.63)	20,000	4,600
Above poverty level	0.31 (0.25–0.37)	1.1 (0.77–1.43)	18,000	5,200
Below poverty level	0.25 (0.21–0.28)	1.16 (0.9–1.41)	23,000	4,900
Toddlers (3 to <6 years)	0.51 (0.45–0.57)	1.98 (1.42–2.54)	11,000	2,900
Children (6 to <11 years)	0.32 (0.26–0.37)	1.19 (0.68–1.71)	18,000	4,800
Adolescents (12 to <16 years)	0.2 (0.17–0.23)	0.86 (0.35–1.37)	29,000	6,600
Adults (16+ years)	0.19 (0.16–0.22)	0.59 (0.23–0.96)	30,000	9,700
Male toddlers (3 to <6 years)	0.57 (0.48–0.65)	2.12 (1.56–2.67)	10,000	2,700
Male children (6 to <11 years)	0.33 (0.26–0.39)	1.62 (0.69–2.56)	17,000	3,500
Male adolescents (12 to <16 years)	0.21 (0.18–0.23)	0.59 (0.12–1.05)	27,000	9,700
Male adults (16+ years)	0.16 (0.12–0.21)	0.49 (–0.03 to 1)	36,000	12,000
Female toddlers (3 to <6 years)	0.4 (0.33–0.47)	1.52 (0.53–2.51)	14,000	3,800
Female children (6 to <11 years)	0.31 (0.23–0.38)	0.88 (0.32–1.44)	18,000	6,500
Female adolescents (12 to <16 years)	0.18 (0.09–0.27)	0.86[a]	32,000	6,600
Females of reproductive age (16–49 years)	0.2 (0.15–0.25)	0.57[a]	29,000	10,000
Female adults (16+ years)	0.25 (0.23–0.28)	1.16 (0.97–1.35)	23,000	4,900

[a] 95% confidence intervals (CI) could not be calculated due to small sample size or a standard error of 0.

4.1.3.3 Overall Confidence in General Population Screening Level Exposure Assessment

The weight of scientific evidence supporting the general population exposure to environmental releases estimate is decided based on the strengths, limitations, and uncertainties associated with the exposure estimates, which are discussed in detail for ambient air, surface water, drinking water, and fish ingestion in the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). EPA summarized its weight of scientific evidence using confidence descriptors: robust, moderate, slight, or indeterminate. The Agency used general considerations (*i.e.*, relevance, data quality, representativeness, consistency, variability, and uncertainties) as well as chemical-specific considerations for its weight of scientific evidence conclusions.

EPA determined robust confidence in its qualitative assessment of biosolids and landfills. For its quantitative assessment for surface water, drinking water, ambient air, and fish ingestion, the Agency modeled exposure due to various general population and environmental release exposure scenarios resulting from different pathways of exposure. Exposure assessments used high-end inputs for the purpose of risk screening. When available, monitoring data were compared to modeled estimates to evaluate overlap, magnitude, and trends. Available monitoring data are presented in *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v). The Agency has robust confidence that EPA-estimated releases and exposure scenarios used are appropriately conservative for a screening level-analysis. Therefore, EPA has robust confidence that no exposure scenarios will lead to greater doses than presented in this risk evaluation. Furthermore, many of the acute dose rates or average daily doses from a single exposure scenario exceed the total daily intake values estimated in Section 4.1.3.2 using NHANES data adding further confidence that the exposure estimates captured high-end exposure scenarios and were appropriately conservative. Despite moderate confidence in the estimated values themselves, confidence in exposure estimates capturing upper-bound exposure scenarios was robust given the conservative assumptions used for the estimates.

4.1.4 Human Milk Exposures

Infants are a potentially susceptible population for various reasons including their higher exposure per body weight, immature metabolic systems, and the potential for chemical toxicants to disrupt sensitive developmental processes. Reasonably available information from studies of experimental animal models also indicates that DIBP is a developmental and reproductive toxicant (U.S. EPA, 2025v). EPA considered exposure and hazard information, as well as pharmacokinetic models, to determine the most appropriate approach to evaluate infant exposure to DIBP from human milk ingestion.

EPA identified eight biomonitoring studies, of which one is a U.S. study, from reasonably available information that investigated if DIBP or its metabolites were present in human milk. In the U.S. study, DIBP's primary metabolite, mono-isobutyl phthalate (MIBP) was measured in 21 samples collected in the Mother's Milk Bank in California. The concentrations ranged from 0.10 to 132.7 ng/g lipid weight with a mean concentration of 23.88 ng/g (Hartle et al., 2018). It is important to note that biomonitoring data do not distinguish between exposure routes or pathways and do not allow for source apportionment. In other words, biomonitoring data reflect total infant exposure through human milk ingestion and the contribution of specific TSCA COUs to overall exposure cannot be determined.

Although EPA explored the potential to model milk concentrations and concluded that there is insufficient information (*e.g.*, sensitive and specific half-life data) available to support modeling of the milk pathway, the Agency also concluded that modeling is not needed to adequately evaluate risks associated with exposure through milk. This is because the POD used in this assessment is based on male reproductive effects resulting from maternal dosing throughout sensitive phases of development (*i.e.*, gestation and perinatal exposure). Because these values designed to be protective of infants are expressed in terms of maternal exposure levels and hazard values to assess direct exposures to infants are unavailable, EPA concluded that further characterization of infant exposure through human milk ingestion would not be informative. The Agency therefore has confidence that the risk estimates calculated based on maternal exposures are protective of a nursing infant. Further discussion of the human milk pathway is provided in the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v).

4.1.5 Aggregate and Sentinel Exposure

TSCA section 6(b)(4)(F)(ii) (15 U.S.C. 2605(b)(4)(F)(ii)) requires EPA, in conducting a risk evaluation, to describe whether aggregate and sentinel exposures under the COUs were considered and the basis for their consideration.

EPA defines aggregate exposure as "the combined exposures to an individual from a chemical substance across multiple routes and across multiple pathways (40 CFR 702.33)." For the DIBP risk evaluation, the Agency considered aggregate risk across all routes of exposure for each individual consumer and occupational COU evaluated for acute, intermediate, and chronic exposure durations. EPA did not consider aggregate exposure for the general population exposed to environmental releases. As described in Section 4.1.3, the Agency employed a risk screen approach for the general population exposure assessment. Based on results from the risk screen, no pathways of concern (*i.e.*, ambient air, surface water, drinking water, fish ingestion) to DIBP exposure were identified for the general population. EPA did not consider aggregate exposure scenarios across COUs because the Agency did not find any evidence to support such an aggregate analysis based on the reasonably available information, such as statistics of populations using certain products represented across COUs or workers performing tasks across COUs. However, EPA considered combined exposure across all routes of exposure for each individual occupational and consumer COU to calculate aggregate risks (Sections 4.3.2 and 4.3.3).

EPA defines sentinel exposure as "the exposure to a chemical substance that represents the plausible upper bound of exposure relative to all other exposures within a broad category of similar or related exposures (40 CFR 702.33)." In terms of this risk evaluation, EPA considered sentinel exposures by considering risks to populations who may have higher exposures; for example, workers and ONUs who perform activities with higher exposure potential, or consumers who have higher exposure potential or certain physical factors like body weight or skin surface area exposed. The Agency characterized high-end exposures in evaluating exposure using both monitoring data and modeling approaches. Where statistical data are available, EPA typically uses the 95th percentile value of the available dataset to characterize high-end exposure for a given COU. For general population and consumer exposures, the Agency occasionally characterized sentinel exposure through a "high-intensity use" category based on elevated consumption rates, breathing rates, or user-specific factors.

4.2 Summary of Human Health Hazard

4.2.1 Background

This section briefly summarizes the non-cancer and cancer human health hazards of DIBP (Section 4.2.2 and 4.2.3). Additional information on the non-cancer and cancer human health hazards of DIBP is provided in the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad) and *Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* (U.S. EPA, 2025b).

4.2.2 Non-Cancer Human Health Hazards of DIBP

The majority of toxicokinetic data for DIBP is derived from oral exposure studies; reasonably available data on other routes of exposure are sparse. A human biomonitoring study conducted by Koch et al. (2012) investigated the metabolism of DIBP following oral exposure and results indicate that DIBP is absorbed across the gastrointestinal tract and metabolized to monoisobutyl phthalate (MIBP); 2OH-MIBP; and 3OH-MIBP. Most of the administered dose of DIBP and its metabolites were excreted in urine within 24 hours. As stated in Section 2 of the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), EPA assumes oral absorption of 100 percent and an inhalation absorption of

100 percent. The Agency used surrogate dermal absorption data from an *ex vivo* study by Beydon et al. (2010) of DBP, a structurally and toxicologically similar phthalate, to estimate the dermal flux of DIBP, as further described in the Occupational Exposures (Section 4.1.1) and Consumer Exposures (Section 4.1.2) summaries.

EPA identified effects on the developing male reproductive system as the most sensitive and robust non-cancer hazard associated with oral exposure to DIBP in experimental animal models. Existing assessments of DIBP also identified effects on the developing male reproductive system as the most sensitive and robust non-cancer effect following oral exposure to DIBP. Existing assessments included those by U.S. CPSC (CPSC, 2014, 2011), Health Canada (Health Canada, 2020; EC/HC, 2015), ECHA (2017a, b), and NICNAS (NICNAS, 2008a)—as well as a systematic review by Yost et al., (2019) that drew conclusions consistent with those of the aforementioned regulatory bodies. EPA also considered epidemiologic evidence qualitatively as part of hazard identification and characterization. However, epidemiologic evidence for DIBP was not considered further for dose-response analysis due to uncertainty associated with exposure characterization of individual phthalates, including source or exposure and timing of exposure as well as co-exposure confounding with other phthalates, discussed in Section 1.1 of *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad). The epidemiological studies provide qualitative support as part of the weight of scientific evidence. This use of epidemiologic evidence qualitatively is consistent with phthalates assessment by Health Canada, U.S. CPSC, NICNAS, and ECHA.

EPA identified 13 oral exposure studies (11 of rats, 2 of mice) that have investigated the developmental and reproductive effects of DIBP following gestational and/or perinatal exposure to DIBP (Gray et al., 2021; Pan et al., 2017; Saillenfait et al., 2017; Wang et al., 2017; Sedha et al., 2015; Furr et al., 2014; Hannas et al., 2012; Hannas et al., 2011; Howdeshell et al., 2008; Saillenfait et al., 2008; BASF, 2007; Borch et al., 2006; Saillenfait et al., 2006). No one- or two-generation reproduction studies of DIBP are available for any route of exposure. Across available studies, the most sensitive developmental effects identified by EPA include effects on the developing male reproductive system consistent with a disruption of androgen action and the development of phthalate syndrome. As stated in Section 4.2.3 of the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), EPA selected a POD of 24 mg/kg-day (human equivalent dose [HED] of 5.7 mg/kg-day) based on phthalate syndrome-related effects on the developing male reproductive system (*i.e.*, decreased fetal testicular testosterone) to estimate non-cancer risks from oral exposure to DIBP for acute, intermediate, and chronic durations of exposure in the risk evaluation of DIBP. The POD was derived from benchmark dose (BMD) modeling of *ex vivo* fetal testicular testosterone data and supports a 95 percent lower confidence limit on the BMD associated with a benchmark response (BMR) of 5 percent ($BMDL_5$) of 24 mg/kg-day (Gray et al., 2021) (Table 4-13).

The Agency has performed ¾-body weight scaling to yield the HED of 5.7 mg/kg-day. Body weight scaling to the three-quarters power is EPA's default approach for deriving an HED in the absence of more chemical-specific information (*e.g.*, PBPK model or data derived extrapolation factor) for such an extrapolation (U.S. EPA, 2011c). A total uncertainty factor of 30 was selected for use as the benchmark MOE (based on an interspecies uncertainty factor [UF_A] of 3× and an intraspecies uncertainty factor [UF_H] of 10×). The UF_H of 10× accounts for variability in toxicokinetics and toxicodynamics within the human population to account for differences in sensitivity. However, data are not available to characterize the magnitude of variability/sensitivity across the human population. Therefore, consistent with agency guidance (U.S. EPA, 2002b), EPA selected a default UF_H of 10×. Consistent with Agency guidance (U.S. EPA, 2011c), the UF_A was reduced from a factor of 10 to 3× because allometric body-weight scaling was used to derive an HED, which accounts for toxicokinetic differences between species. The remaining UF_A of 3× accounts for species differences in toxicodynamics. EPA considered reducing the UF_A further to a value of 1 based on apparent differences in toxicodynamics between rats and humans. As discussed in Section 3.1.4 of EPA's *Draft Proposed Approach for Cumulative Risk Assessment of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c), several explant (Lambrot et al., 2009; Hallmark et al., 2007) and xenograft studies (van Den Driesche et al., 2015; Spade et al., 2014; Heger et al., 2012; Mitchell et al., 2012) using human donor fetal testis tissue have been conducted to investigate the antiandrogenicity of mono-2-ethylhexyl phthalate (MEHP; a monoester metabolite of DEHP), DBP, and monobutyl phthalate (MBP; a monoester metabolite of DBP) in a human model. Generally, results from human explant and xenograft studies suggest that human fetal testes are less sensitive than rat testes to the antiandrogenic effects of phthalates, however, effects on Sertoli cells and increased incidence of MNGs have been observed in four human xenograft studies of DBP (van Den Driesche et al., 2015; Spade et al., 2014; Heger et al., 2012; Mitchell et al., 2012). As discussed in EPA's draft approach document (U.S. EPA, 2023c), the available human explant and xenograft studies have limitations and uncertainties, which preclude definitive conclusions related to species differences in sensitivity. For example, key limitations and uncertainties of the human explant and xenograft studies include: small sample size; human testis tissue was collected from donors of variable age and by variable non-standardized methods; and most of the testis tissue was taken from fetuses older than 14 weeks, which is outside of the critical window of development (*i.e.*, gestational weeks 8 to 14 in humans). Therefore, EPA did not further reduce the UF_A to a value of 1.

Based on the strengths, limitations, and uncertainties discussed Section 4.3 of the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), EPA reviewed the weight of scientific evidence and has *robust overall confidence in the POD based on decreased fetal testicular testosterone for use in characterizing risk from exposure to DIBP for acute, intermediate, and chronic exposure scenarios*. The applicability and relevance of this POD for all exposure durations (acute, intermediate, and chronic) is described in the introduction to Section 4 and Appendix B of the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad). For purposes of assessing non-cancer risks, the selected POD is considered most applicable to females of reproductive age, pregnant women, and male infants. Use of this POD to assess risk for other age groups (*e.g.*, older children, adult males, and the elderly) is considered to be conservative and appropriate for a screening level assessment for these other age groups.

No data are reasonably available for the dermal or inhalation routes that are suitable for deriving route-specific PODs. Therefore, EPA is using the acute/intermediate/chronic oral POD to evaluate risks from dermal and inhalation exposure to DIBP. For the dermal route, differences in absorption are being accounted for in dermal exposure estimates in the risk evaluation for DIBP. For the inhalation route, the Agency is extrapolating the oral HED to an inhalation HEC per EPA's *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (U.S. EPA, 1994b) using the updated human body weight and breathing rate relevant to continuous exposure of an individual at rest provided in EPA's *Exposure Factors Handbook: 2011 Edition* (U.S. EPA, 2011b). The oral HED and inhalation HEC values selected by EPA to estimate non-cancer risk from acute/intermediate/chronic exposure to DIBP in the risk evaluation of DIBP are summarized in Table 4-13.

Table 4-13. Non-Cancer HED and HEC Used to Estimate Risks

Exposure Scenario	Target Organ System	Species	Duration	POD (mg/kg-day)	Effect	HED (mg/ kg-day)	HEC (mg/m^3) [ppm]	Benchmark MOE	Reference (TSCA Study Quality Rating)
Acute, intermediate, chronic	Developmental toxicity	Rat	4 days during gestation (GDs 14–18)	$BMDL_5$ = 24	↓ *ex vivo* fetal testicular testosterone production	5.7	30.9 [2.71]	UF_A = 3 [a] UF_H = 10 *Total UF=30*	(Gray et al., 2021) (High)

HEC = human equivalent concentration; HED = human equivalent dose; MOE = margin of exposure; NOAEL = no-observed-adverse-effect level; POD = point of departure; UF = uncertainty factor
[a] EPA used allometric body weight scaling to the ¾-power to derive the HED. Consistent with EPA guidance (U.S. EPA, 2011c), the UF_A was reduced from 10× to 3×.

4.2.3 Cancer Human Health Hazards of DIBP

DIBP has not been evaluated for carcinogenicity in any 2-year cancer bioassays. EPA therefore evaluated the utility of read-across approaches to assess potential cancer hazards of DIBP based on cancer bioassays and MOA information available for other phthalates being evaluated under TSCA (*i.e.*, DEHP, DBP, BBP, DCHP, DINP, DIDP) as discussed in the *Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* (U.S. EPA, 2025b).

EPA used elements of the Rethinking Chronic Toxicity and Carcinogenicity Assessment for Agrochemicals Project (ReCAAP) weight of evidence framework (Hilton et al., 2022) to determine the need for carcinogenicity studies for DIBP. The framework takes into consideration multiple lines of evidence to support decision-making for the chemical(s) of interest—including information pertaining to nomenclature, physical and chemical properties; exposure and use patterns; absorption, distribution, metabolism, and excretion (ADME) properties; and toxicological data (*e.g.*, genetic toxicity, acute toxicity, subchronic toxicity, hormone perturbation, immunotoxicity, and mode of action). The framework was developed by a workgroup comprising scientists from academia, government (including EPA), non-governmental organizations, and industry stakeholders.

Recently, the Organisation for Economic Co-operation and Development (OECD) developed several Integrated Approach to Testing and Assessment (IATA) case studies demonstrating applicability of the weight of evidence framework (OECD, 2024). As part of this weight of evidence approach, human health hazard profiles for DIBP were evaluated and compared to profiles for five read-across chemicals, including DEHP, DBP, BBP, DINP, and DIDP. Overall, based on the weight of scientific evidence, EPA has concluded that the non-cancer POD for DIBP based on effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome that was selected for characterizing risk from acute, intermediate, and chronic exposure to DIBP is appropriate for use in human health risk assessment and is protective of human health, including for PESS (U.S. EPA, 2025b, 2025ad). Furthermore, as discussed in the cancer human health hazard assessment (U.S. EPA, 2025b) *EPA concludes that potential carcinogenicity of DIBP is not a significant remaining source of uncertainty in the quantitative and qualitative risk characterization, despite the lack of carcinogenicity bioassays for DIBP*. Further, these conclusions are based on two key weight of scientific evidence considerations that will be explained in the following paragraph.

First, DIBP is toxicologically similar to DEHP, DBP, BBP, DINP, and DCHP and can induce antiandrogenic effects and disrupt fetal testicular testosterone biosynthesis in rats leading to a spectrum of effects on the developing male reproductive system consistent with phthalate syndrome. Second, for the five read-across phthalates, effects on the developing male reproductive system consistent with phthalate syndrome was the most sensitive and robust endpoint for deriving PODs for use in characterizing risk for acute, intermediate, and chronic exposure scenarios. The only exception to this was for DINP, in which chronic non-cancer liver effects were identified as a more sensitive outcome than developmental toxicity for deriving a chronic POD. Finally, EPA has determined that quantitative cancer risk assessment is not needed for DEHP, DINP, DIDP, DBP, or BBP (U.S. EPA, 2025b).

4.3 Human Health Risk Characterization

4.3.1 Risk Assessment Approach

The exposure scenarios, populations of interest, and toxicological endpoints used for evaluating risks from acute, short-term/intermediate, and chronic/lifetime exposures are summarized in Table 4-14.

Table 4-14. Exposure Scenarios, Populations of Interest, and Hazard Values

<table>
<tr><td rowspan="4">Population of Interest and Exposure Scenario</td><td>Workers
Male and female adolescents and adults (16+ years) and females of reproductive age directly working with DIBP under light activity (breathing rate of 1.25 m^3/h) (for further details see (U.S. EPA, 2025w))
<u>Exposure Durations</u>
• Acute – 8 hours for a single workday
• Intermediate – 8 hours per workday for 22 days per 30-day period
• Chronic – 8 hours per workday for 250 days per year for 31 or 40 working years
<u>Exposure Routes</u>
• Inhalation and dermal</td></tr>
<tr><td>Occupational Non-Users
Male and female adolescents and adults (16+ years) indirectly exposed to DIBP within the same work area as workers (breathing rate of 1.25 m^3/h) (for further details see (U.S. EPA, 2025w))
<u>Exposure Durations</u>
• Acute, Intermediate, and Chronic – same as workers
<u>Exposure Routes</u>
• Inhalation, dermal (mist and dust deposited on surfaces)</td></tr>
<tr><td>Consumers
Male and female infants (<1 year), toddlers (1–2 years), children (3–5 years and 6–10 years), young teens (11–15 years), teenagers (16–20 years) and adults (21+ years) exposed to DIBP through product or article use (for further details see (U.S. EPA, 2025e))
<u>Exposure Frequency</u>
• Acute – 1 day exposure
• Intermediate – 30 days per year
• Chronic – 365 days per year
<u>Exposure Routes</u>
• Inhalation, dermal, and oral</td></tr>
<tr><td>Bystanders
Male and female infants (<1 year), toddlers (1–2 years), and children (3–5 years and 6–10 years) incidentally exposed to DIBP through product use (for further details see (U.S. EPA, 2025e))
<u>Exposure Frequency</u>
• Acute – 1 day exposure
• Intermediate – 30 days per year
• Chronic – 365 days per year
<u>Exposure Routes</u>
• Inhalation</td></tr>
</table>

Population of Interest and Exposure Scenario	**General Population** Male and female infants, children, youth, and adults exposed to DIBP through drinking water, surface water, ambient air, and fish ingestion (for further details see (U.S. EPA, 2025v)) Exposure Durations • *Acute* – Exposed to DIBP continuously for a 24-hour period • *Chronic* – Exposed to DIBP continuously for up to 78 years Exposure Routes • Inhalation, dermal, and oral (depending on exposure scenario)
	Cumulative Exposure Based on NHANES Biomonitoring Children aged 3–5, 6–11 years, and 11 to <16 years; male and female adults 16+ years; and females of reproductive age (16–49 years of age) exposed to DEHP, DBP, BBP, DIBP, and DINP through all exposure pathways and routes as measured through urinary biomonitoring (*i.e.*, NHANES) (for further details see (U.S. EPA, 2025ap)) Exposure Durations • Durations not easily characterized in urinary biomonitoring studies • Likely between acute and intermediate as phthalates have elimination half-lives on the order of several hours and are quickly excreted from the body in urine. Spot urine samples, as collected through NHANES, are representative of relatively recent exposures. Exposure Routes • NHANES urinary biomonitoring data provides an estimate of aggregate exposure (*i.e.*, exposure through oral, inhalation, and dermal routes)
Health Effects, Concentration and Time Duration	**Non-Cancer Acute/Intermediate/Chronic Value** Sensitive health effect: Developmental toxicity (*i.e.*, effects on the developing male reproductive system; *i.e.*, decreased fetal testicular testosterone) (for further details see (U.S. EPA, 2025ad)) HEC Daily, continuous = 30.9 mg/m^3 (2.71 ppm) HED Daily = 5.7 mg/kg-day; dermal and oral Total UF (benchmark MOE) = 30 (UF_A = 3; UF_H = 10) **Hazard Relative Potency** Relative potency factors for DEHP, DBP, BBP, DIBP, DCHP, and DINP were derived based on reduced fetal testicular testosterone. DBP was selected as the index chemical (for further details see (U.S. EPA, 2025ap)). RPF_{DEHP} = 0.84 RPF_{DBP} = 1 (index chemical) RPF_{BBP} = 0.52 RPF_{DIBP} = 0.53 RPF_{DCHP} = 1.66 RPF_{DINP} = 0.21 Index chemical (DBP) POD = HED Daily = 2.1 mg/kg-day Total UF (benchmark MOE) = 30 (UF_A = 3; UF_H = 10)

4.3.1.1 Estimation of Non-Cancer Risks from Exposure to DIBP

EPA used a margin of exposure (MOE) approach to identify potential non-cancer risks for individual exposure routes (*i.e.*, oral, dermal, and inhalation). The MOE is the ratio of the non-cancer POD divided by a human exposure dose. Acute, short-term, and chronic MOEs for non-cancer inhalation and dermal risks were calculated using Equation 4-1.

Equation 4-1. Margin of Exposure Calculation

$$MOE = \frac{Non - Cancer\ Hazard\ Value\ (POD)}{Human\ Exposure}$$

Where:

MOE	=	Margin of exposure for acute, intermediate, or chronic risk comparison (unitless)
Non-Cancer Hazard Value (POD)	=	HEC (mg/m^3) or HED (mg/kg-day)
Human Exposure	=	Exposure estimate (mg/m^3 or mg/kg-day)

MOE risk estimates may be interpreted in relation to benchmark MOEs. Benchmark MOEs are typically the total UF for each non-cancer POD. The MOE estimate is interpreted as a human health risk of concern if the MOE estimate is less than the benchmark MOE (*i.e.*, the total UF). On the other hand, if the MOE estimate is equal to or exceeds the benchmark MOE, the risk is not considered to be of concern and mitigation is not needed. Typically, the larger the MOE, the more unlikely it is that a non-cancer adverse effect occurs relative to the benchmark. When determining whether a chemical substance presents unreasonable risk to human health or the environment, calculated risk estimates are not "bright-line" indicators of unreasonable risk, and EPA has the discretion to consider other risk-related factors in addition to risks identified in the risk characterization.

4.3.1.2 Estimation of Non-Cancer Aggregate Risks from Exposure to DIBP

As described in Section 4.1.5, EPA considered aggregate risk from exposure to DIBP across all routes of exposure for each individual consumer and occupational COU evaluated for acute, intermediate, and chronic exposure durations. To identify potential non-cancer risks for aggregate exposure scenarios for workers (Section 4.3.2) and consumers (Section 4.3.3), EPA used the total MOE approach (U.S. EPA, 2001). For the total MOE approach, MOEs for each exposure route of interest in the aggregate scenario must first be calculated. The total MOE for the aggregate scenario can then be calculated using Equation 4-2.

Equation 4-2. Total Margin of Exposure Calculation

$$Total\ MOE = \frac{1}{\frac{1}{MOE_{Oral}} + \frac{1}{MOE_{Dermal}} + \frac{1}{MOE_{Inhalation}} \cdots}$$

Where:

Total MOE	=	Margin of exposure for aggregate scenario (unitless)
MOE_{Oral}	=	Margin of exposure for oral route (unitless)
MOE_{Dermal}	=	Margin of exposure for dermal route (unitless)
$MOE_{Inhalation}$	=	Margin of exposure for inhalation route (unitless)

Total MOE risk estimates may be interpreted in relation to benchmark MOEs, as described in Section 4.3.1.1.

4.3.2 Risk Estimates for Workers

Risk estimates for workers from inhalation and dermal exposures, as well as aggregated exposures, are shown in Table 4-16. This section provides a summary and characterization of risk estimates for workers, including females of reproductive age and ONUs, for the various OESs. As discussed in Section 4.1.1.4, the weight of scientific evidence is moderate for all assessed inhalation and dermal exposures to workers and slight to moderate for all assessed inhalation and dermal exposures to ONUs.

Application of Paints and Coatings

Spray Applications: For spray application of paints and coatings, inhalation exposures contribute to risk in the case of high-end exposures. High-end acute, intermediate and chronic exposures to workers who are average adults or females of reproductive age resulted in MOEs ranging from 1.9 to 3 in the case of inhalation exposure and MOEs ranging from 90 to 143 in the case of dermal exposure. Similarly, central tendency exposures resulted in MOEs ranging from 122 to 197 in the case of inhalation exposure and MOEs ranging from 181 to 287 in the case of dermal exposure. For ONUs, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark.

Because occupational exposure estimates indicate high exposure potential to workers spray applying products containing DIBP, it is important to provide a more detailed explanation of considerations behind the assessment here. Specifically, the assessment of spray application of paint and coating products containing DIBP is based on potential exposure of workers to mist concentrations during spray coating and known product concentrations of paint and coating products containing DIBP. EPA used mist monitoring data from the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a), which resulted in 50th and 95th percentile values of 3.38 mg/m^3 and 22.1 mg/m^3, respectively. The underlying mist concentration data considered in the ESD reflected a variety of industrial and commercial automotive refinishing scenarios (*e.g.*, different gun types and booth configurations). The ESD also provides a methodology for estimating the concentration of non-volatile compound in the mist in relation to the concentration of chemical in the product, and this is discussed in greater detail in Appendix D.13.2 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). The range of product concentrations was derived from known paint and coating products containing DIBP, and product SDS analysis resulted in a mode of product concentrations of 5 percent and a maximum product concentration of 60 percent. For estimating occupational inhalation exposure values, EPA used the 50th percentile mist concentration (*i.e.*, 3.38 mg/m^3) and the mode of product concentrations (*i.e.*, 5%) to estimate the central tendency exposure and EPA used the 95th percentile mist concentration (*i.e.*, 22.1 mg/m^3) and the maximum product concentration (*i.e.*, 60%) to estimate the high-end exposure.

The high-end estimate of inhalation exposure for average adult workers resulted in an acute exposure level of 2.8 mg/kg/day and an associated MOE value of 2.1 for spray application of paints and coatings. As mentioned above, this high-end estimate is based on the maximum DIBP product concentration of 60 percent, and this maximum concentration carries uncertainty since it based only on one product. Instead, using the mode[8] of product concentrations of 5 percent along with the 95th percentile mist concentration for the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry, the acute inhalation exposure level for an average adult worker is estimated as 0.55 mg/kg/day which is associated with an MOE value of 10. Therefore, EPA acknowledges the possibility of a high-end acute inhalation exposure below the benchmark MOE of 30 for workers involved in spray application of paints and coatings containing DIBP. However, worker exposures at the 95th percentile of mist concentration are not expected on a daily basis, but rather infrequently as suggested by the statistically high percentile value. Consequently, central tendency estimates of inhalation exposure are expected to represent potential intermediate and chronic level exposures to workers involved in spray application of paints and coatings containing DIBP.

[8] The mode is the value that occurs most frequently in a given set of data. Given the uncertainties in the maximum product concentration, there is greater confidence in the mode than the mean (average) for determining the central tendency of this dataset.

Non-Spray Applications: For non-spray application of paints and coatings, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark. MOEs for inhalation exposures ranged from 2,256 to 16,644 while MOEs for dermal exposures ranged from 90 to 287. Due to the low exposure potential for non-spray applied paint and coating products containing DIBP, EPA does not expect occupational exposures to lead to risk levels below the benchmark MOE of 30.

Application of Adhesives and Sealants

Spray Applications: For spray application of adhesives and sealants, inhalation exposures contribute to risk in the case of both high-end and central tendency exposures. High-end acute, intermediate and chronic exposures to workers who are average adults or females of reproductive age resulted in MOEs ranging from 1.9 to 3 in the case of inhalation exposure and MOEs ranging from 90 to 143 in the case of dermal exposure. Similarly, central tendency exposures resulted in MOEs ranging from 20 to 35 in the case of inhalation exposure and MOEs ranging from 181 to 309 in the case of dermal exposure. For ONUs, all MOEs associated with dermal exposure exceed the MOE benchmark; however, MOEs associated with inhalation exposure to ONUs ranged from 22 to 35 for estimates across acute, intermediate, and chronic levels of inhalation exposure.

Because occupational exposure estimates indicate high exposure potential to workers spray applying products containing DIBP, it is important to provide a more detailed explanation of considerations behind the assessment here. Specifically, the assessment of spray application of adhesive and sealant products containing DIBP is based on potential mist concentrations experienced by workers during spray coating as well as known product concentrations of adhesive and sealant products containing DIBP. EPA used mist monitoring data from the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry (OECD, 2011a), which showed 50th and 95th percentile values of 3.38 mg/m^3 and 22.1 mg/m^3, respectively. The underlying mist concentration data considered in the ESD reflected a variety of industrial and commercial automotive refinishing scenarios (*e.g.*, different gun types and booth configurations). The ESD also provides a methodology for estimating the concentration of non-volatile compound in the mist in relation to the concentration of chemical in the product, and this is discussed in greater detail in Appendix D.13.2 of the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w). The range of product concentrations was derived from known adhesive and sealant products containing DIBP, and product SDS analysis resulted in a mode of product concentrations of 30 percent and a maximum concentration of 60 percent. The mode and maximum product concentrations for adhesives and sealants are supported by several existing products. For estimating occupational inhalation exposure values, EPA used the 50th percentile mist concentration (*i.e.*, 3.38 mg/m^3) and the mode of product concentrations (*i.e.*, 30%) to estimate the central tendency exposure and EPA used the 95th percentile mist concentration (*i.e.*, 22.1 mg/m^3) and the maximum product concentration (*i.e.*, 60%) to estimate the high-end exposure.

High-end exposures from adhesive and sealant spray application may occur due to a confluence of a subset of variables (*e.g.*, low ventilation, *etc.*). While most workers are not expected to experience high-end exposure conditions, they are considered plausible in the case of an acute one-day exposure. However, worker exposures at the 95th percentile of mist concentration are not expected on a daily basis, but rather infrequently as suggested by the statistically high percentile value. Consequently, central tendency estimates of inhalation exposure are expected to represent potential intermediate and chronic level exposures to workers involved in spray application of adhesives and sealants containing DIBP.

Non-Spray Applications: For non-spray application of adhesives and sealants, all MOEs associated with inhalation and dermal exposure exceed the MOE benchmark. MOEs for inhalation exposures ranged from 2,256 to 17,935 and MOEs for dermal exposures ranged from 90 to 309. Due to the low exposure potential for non-spray applied adhesive and sealant products containing DIBP, EPA does not expect occupational exposures to lead to risk levels below the benchmark MOE of 30.

OES with Exposures Above Benchmark

DIBP has low volatility (*i.e.*, 4.76×10^{-5} mmHg), low rates of dermal absorption in humans, and low dust concentrations in occupational settings (*i.e.*, weight fractions ranging from 1.3×10^{-6} to 0.18). Consequently, the estimated levels of occupational exposure are relatively low for the majority of OES as evident from the MOE values reported in Table 4-16. Estimated occupational exposures (inhalation, dermal, and aggregate) are above the benchmark MOE of 30, and therefore not indicative of occupational risk, for the following OESs: Manufacturing; Import and repackaging; Incorporation into paints and coatings, Incorporation into adhesives and sealants; Use as a catalyst -formulation into pre-catalyst; Use as a catalyst -intermediate in polypropylene manufacturing; Plastics compounding; Plastics converting; Rubber converting; Application of paints and coatings (non-spray applications); Application of adhesives and sealants (non-spray applications); Use of laboratory chemicals (liquid and solid); Fabrication or use of final products and articles; Recycling; and Waste handling, treatment, and disposal. For rubber compounding, acute high-end aggregate exposures result in MOE values that border the benchmark (*i.e.*, 30 for average adult workers and 29 for female workers of reproductive age); however, the high-end inhalation exposure levels are based on the assumption that the concentration of DIBP in workplace dust is the same as the concentration of DIBP in the final product. Because this assumption likely leads to an overestimate in worker inhalation exposure, EPA expects exposure levels from rubber compounding to be less than the acute high-end aggregate exposure estimates. Consequently, worker exposures from rubber compounding are not expected to lead to risk values below the benchmark MOE. Lastly, exposures from distribution in commerce were not assessed directly, but levels of exposure are expected to be similar to manufacturing and import/repackaging. For the crosswalk between OESs and COUs, see Table 3-1 in Section 3.1.1.1.

4.3.2.1 Overall Confidence in Worker Risk Estimates for Individual DIBP COUs

As described in Section 4.1.1.4, in general EPA has moderate confidence in the inhalation exposure estimates for females of reproductive age and average adult workers and moderate confidence in dermal exposure estimates. EPA has slight to moderate confidence in the assessed inhalation exposures for ONUs and slight to moderate confidence in the assessed ONU dermal exposures. As described in Section 4.2, EPA has robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP. Therefore, the Agency has moderate confidence overall in the risk estimates calculated for females of reproductive age and average adult workers inhalation and dermal exposure scenarios. Sources of uncertainty associated with these occupational COUs are discussed above in Section 4.1.1.4.

4.3.2.2 Consideration of Personal Protective Equipment (PPE)

The Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) both recommend employers utilize the hierarchy of controls[9] to address hazardous exposures in the workplace. The hierarchy of controls strategy outlines, in descending order of priority, the use of elimination, substitution, engineering controls, administrative controls, and lastly PPE. The hierarchy of controls prioritizes the most effective measures, which eliminate or substitute the harmful chemical (*e.g.*, use a different process, substitute with a less hazardous material), thereby

[9] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf (accessed December 29, 2025).

preventing or reducing exposure potential. Following elimination and substitution, the hierarchy recommends engineering controls to isolate employees from the hazard, followed by administrative controls or changes in work practices to reduce exposure potential (*e.g.*, source enclosure, local exhaust ventilation systems). Administrative controls are policies and procedures instituted and overseen by the employer to protect worker exposures. OSHA and NIOSH recommend the use of PPE (*e.g.*, respirators, gloves) as the last means of control, when the other control measures cannot reduce workplace exposure to an acceptable level.

4.3.2.2.1 Respiratory Protection

OSHA's Respiratory Protection Standard (29 CFR 1910.134) requires employers in certain industries to address workplace hazards by implementing engineering control measures and, if these are not feasible, providing respirators that are applicable and suitable for the purpose intended. Respirator selection provisions are provided in section 1910.134(d) and require that appropriate respirators be selected based on the respiratory hazard(s) to which the worker will be exposed, in addition to workplace and user factors that affect respirator performance and reliability. Assigned protection factors (APFs) are provided in Table 1 under section 1910.134(d)(3)(i)(A) (see below in Table 4-15) and refer to the level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a respiratory protection program according to the requirements of OSHA's Respiratory Protection Standard.

Workers are required to use respirators that meet or exceed the required level of protection listed in Table 4-15. Based on the APF, inhalation exposures may be reduced by a factor of 5 to 10,000, if respirators are properly worn and fitted.

Table 4-15. Assigned Protection Factors for Respirators in OSHA Standard 29 CFR 1910.134

Type of Respirator	Quarter Mask	Half Mask	Full Facepiece	Helmet/ Hood	Loose-Fitting Facepiece
1. Air-purifying respirator	5	10	50	–	–
2. Power air-purifying respirator (PAPR)	–	50	1,000	25/1,000	25
3. Supplied-air respirator (SAR) or airline respirator					
• Demand mode	–	10	50	–	–
• Continuous flow mode	–	50	1,000	25/1,000	25
• Pressure-demand or other positive-pressure mode	–	50	1,000	–	–
4. Self-contained breathing apparatus (SCBA)					
• Demand mode	–	10	50	50	–
• Pressure-demand or other positive-pressure mode (*e.g.*, open/closed circuit)	–	–	10,000	10,000	–
Source: 29 CFR 1910.134(d)(3)(i)(A)					

4.3.2.3 Occupational Risk Estimates and Effect of PPE

Table 4-16 presents the acute duration risk estimates for all worker populations and the corresponding PPE that would result in an acute worker MOE above the benchmark MOE. Any exposure scenario with risk estimates below the benchmark MOE of 30 are bolded and highlighted. For occupational risk estimates, females of reproductive age are the most sensitive exposed population with the lowest worker MOEs. Furthermore, the acute exposure duration results in the lowest worker MOEs for this population.

Risk estimates for all populations, durations, and health effects for all the COUs/OES are included in Table 4-16 and the *Risk Calculator for Occupational Exposures for DIBP* (U.S. EPA, 2025ai). Additionally, the risk calculator contains MOE calculations and PPE information for all OESs.

Table 4-16 includes three main sections according to the route of exposure: inhalation, dermal, and aggregate exposure. Assigned Protection Factors (APF) are the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when implemented as part of a continuous, effective respiratory program which includes training, fit testing, maintenance and use requirements. For inhalation, typical respirator APF values of 5, 10, 25, 50, 1,000, and 10,000 were compared to the calculated MOE and the benchmark MOE to determine the level of APF that could be used to bring MOEs above the benchmark MOE. Similarly for aggregate exposures, the APF that could be used to bring MOEs above the benchmark are also shown. The appropriateness of any protection factor that demonstrates exposures resulting in a worker MOE above the benchmark MOE may require additional considerations (*e.g*., chemical-specific form, formulation, exposure scenario, etc.). The presented protection factors simply represent a value by which corresponding PPE may theoretically increase the estimated worker MOE above the benchmark MOE. The practicality and feasibility of implementing any PPE corresponding to a protection factor is part of a larger evaluation of effective occupational control strategies and will be further discussed in any forthcoming risk management actions. Such an evaluation should take into consideration the hierarchy of hazard control options. The hierarchy of controls from most to least effective are elimination, substitution, engineering controls, administrative controls, and PPE.

Table 4-16 shows that using PPE for the two inhalation scenarios where the MOEs are below the benchmark MOE (*i.e.,* spray application of paints/coatings and spray application of adhesives/sealants), may decrease inhalation exposure levels such that the resulting MOE values are above the benchmark MOE of 30.

4.3.2.4 Occupational Risk Estimates for ONUs

ONUs may be exposed to dust, vapors or mists that enter their breathing zone while working in locations near where DIBP handling occurs. For inhalation exposure, in absence of data specific to ONU exposure, EPA assumes that worker central tendency exposure is representative of ONU exposure. Also, dermal exposure to ONUs were assessed for scenarios where there may be dust or mist generation since it is possible that in some situations an ONU may inadvertently contact a surface that has been contaminated by dust or mist containing DIBP. Dermal exposure to ONUs is represented by incidental skin contact equal to the surface area of one palm. EPA has slight to moderate confidence in inhalation and dermal in the assessed ONU exposures.

Table 4-16. Occupational Risk Summary Table for DIBP

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Manufacturing – Importing	Importing	Repackaging into large and small containers	Average Adult Worker	Central Tendency	11,400	15,545	20,005	N/A	181	246	317	178	242	312	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	18,111	N/A	197	268	345	193	263	338	N/A
Processing – Repackaging	Repackaging (*e.g.*, laboratory chemicals)			High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing	Average Adult Worker	Central Tendency	11,398	15,543	16,641	N/A	181	246	264	178	242	260	N/A
				High-End	2,491	3,397	3,637	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,319	14,071	15,066	N/A	197	268	287	193	263	282	N/A
				High-End	2,255	3,075	3,292	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,398	15,543	16,066	N/A	1,253	1,709	1,830	1,129	1,540	1,649	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Average Adult Worker	Central Tendency	10,873	14,826	17,796	N/A	181	246	296	178	242	291	N/A
				High-End	2,171	2,961	3,170	N/A	90	123	132	87	118	127	N/A
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; Paints and coatings		Females of Reproductive Age	Central Tendency	9,843	13,423	16,111	N/A	197	268	322	193	263	315	N/A
				High-End	1,996	2,681	2,870	N/A	98	134	143	94	128	137	N/A
	Processing aids, not otherwise listed		ONU	Central Tendency	10,873	14,826	15,874	N/A	1,253	1,709	2,089	795	1,084	1,325	N/A
Processing – Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastics converting	Average Adult Worker	Central Tendency	2,171	2,961	3,619	N/A	627	855	1,045	486	663	811	N/A
				High-End	124	169	181	N/A	313	427	458	89	121	130	N/A
			Females of Reproductive Age	Central Tendency	1,966	2,681	3,276	N/A	682	930	1,137	506	691	844	N/A
				High-End	112	153	164	N/A	341	465	498	84	115	123	N/A
			ONU	Central Tendency	2,171	2,961	3,619	N/A	1,253	1,709	2,089	795	1,084	1,325	N/A

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere; Foam pipeline pigs	Rubber compounding	Average Adult Worker	Central Tendency	456	622	711	N/A	181	246	282	129	176	202	N/A
				High-End	45	61	65	N/A	90	123	132	30	41	44	N/A
			Females of Reproductive Age	Central Tendency	413	563	644	N/A	197	268	307	133	182	208	N/A
				High-End	41	55	59	N/A	98	134	143	**29**	39	42	APF 5
			ONU	Central Tendency	456	622	711	N/A	1,253	1,709	1,955	334	456	522	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere; Foam pipeline pigs	Rubber converting	Average Adult Worker	Central Tendency	912	1,244	1,520	N/A	627	855	1,045	371	507	619	N/A
				High-End	48	65	69	N/A	313	427	458	41	56	60	N/A
			Females of Reproductive Age	Central Tendency	826	1,126	1,376	N/A	682	930	1,137	374	509	623	N/A
				High-End	43	59	63	N/A	341	465	498	38	52	56	N/A
			ONU	Central Tendency	912	1,244	1,520	N/A	1,253	1,709	2,089	528	720	880	N/A
Industrial Use – Paints and coatings; Commercial Use – Paints and coatings	Paints and coatings	Application of paints and coatings (spray application)	Average Adult Worker	Central Tendency	135	184	197	N/A	181	246	264	77	105	113	N/A
				High-End	**2.1**	**2.8**	**3.0**	APF 25	90	123	132	**2.0**	**2.8**	**2.9**	APF 25
			Females of Reproductive Age	Central Tendency	122	167	178	N/A	197	268	287	75	103	110	N/A
				High-End	**1.9**	**2.5**	**2.7**	APF 25	98	134	143	**1.8**	**2.5**	**2.7**	APF 25
			ONU	Central Tendency	135	184	197	N/A	361	492	527	98	134	143	N/A
Industrial Use – Paints and coatings; Commercial Use – Paints and coatings	Paints and coatings	Application of paints and coatings (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (spray application)	Average Adult Worker	Central Tendency	**22**	31	35	APF 5	181	246	284	**20**	**27**	31	APF 5
				High-End	**2.1**	**2.8**	**3.0**	APF 25	90	123	132	**2.0**	**2.8**	**2.9**	APF 25
			Females of Reproductive Age	Central Tendency	**20**	**28**	32	APF 5	197	268	309	**18**	**25**	**29**	APF 5
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives			High-End	**1.9**	**2.5**	**2.7**	APF 25	98	134	143	**1.8**	**2.5**	**2.7**	APF 25
			ONU	Central Tendency	**22**	31	35	APF 5	361	492	568	**21**	**29**	33	APF 5
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	17,935	N/A	181	246	284	178	242	280	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,267	N/A	197	268	309	193	263	303	N/A
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives			High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	17,935	N/A	N/A	N/A	N/A	11,400	15,545	17,935	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (liquids)	Average Adult Worker	Central Tendency	11,400	15,545	17,706	N/A	181	246	280	178	242	276	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,030	N/A	197	268	305	193	263	300	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	17,706	N/A	N/A	N/A	N/A	11,400	15,545	17,706	N/A

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Average Adult Worker	Central Tendency	240,000	327,27	372,766	N/A	627	855	973	625	852	971	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Average Adult Worker	High-End	16,889	23,030	24,658	N/A	313	427	458	308	420	449	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Females of Reproductive Age	Central Tendency	217,275	296,284	337,470	N/A	682	930	1,059	680	927	1,056	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Females of Reproductive Age	High-End	15,290	20,850	22,323	N/A	341	465	498	334	455	487	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	ONU	Central Tendency	240,000	327,273	372,766	N/A	1,253	1,709	1,947	1,247	1,700	1,937	N/A
Processing – Recycling	Recycling	Recycling	Average Adult Worker	Central Tendency	877	1,196	1,435	N/A	627	855	1,026	366	498	598	N/A
Processing – Recycling	Recycling	Recycling	Average Adult Worker	High-End	63	87	93	N/A	313	427	458	53	72	77	N/A
Processing – Recycling	Recycling	Recycling	Females of Reproductive Age	Central Tendency	794	1,083	1,299	N/A	682	930	1,116	367	500	601	N/A
Processing – Recycling	Recycling	Recycling	Females of Reproductive Age	High-End	57	78	84	N/A	341	465	498	49	67	72	N/A
Processing – Recycling	Recycling	Recycling	ONU	Central Tendency	877	1,196	1,435	N/A	1,253	1,709	2,052	516	704	844	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Average Adult Worker	Central Tendency	877	1,196	1,435	N/A	627	855	1,026	366	498	598	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Average Adult Worker	High-End	63	87	93	N/A	313	427	458	53	72	77	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Females of Reproductive Age	Central Tendency	794	1,083	1,299	N/A	682	930	1,116	367	500	601	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Females of Reproductive Age	High-End	57	78	84	N/A	341	465	498	49	67	72	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	ONU	Central Tendency	877	1,196	1,435	N/A	1,253	1,709	2,052	516	704	844	N/A
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Average Adult Worker	Central Tendency	1,140	1,555	1,664	N/A	627	855	915	404	551	590	N/A
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Average Adult Worker	High-End	127	173	185	N/A	313	427	458	90	123	132	N/A
Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Females of Reproductive Age	Central Tendency	1,032	1,407	1,507	N/A	682	930	996	411	560	600	N/A
Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Females of Reproductive Age	High-End	115	156	167	N/A	341	465	498	86	117	125	N/A
Commercial Use – Toys, playground, and sporting equipment	Toys, playground, and sporting equipment	Fabrication or use of final products and articles	ONU	Central Tendency	1,140	1,555	1,664	N/A	1,253	1,709	1,830	597	814	872	N/A

[a] In absence of ONU inhalation exposure data, EPA used worker central tendency exposure estimates as surrogate data for ONU inhalation exposure. Dermal exposures to ONUs are represented by incidental skin contact equal to the surface area of one palm.

Life Cycle Stage – Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]

[b] This value is the protection factor of PPE required to raise the acute MOE above the benchmark of 30. The Assigned Protection Factors (APF) associated with different types of respirators based on function (air-purifying, powered air purifying, supplied air) and fit (quarter mask, half-mask, full-face piece, helmet/hood, loose-fitting facepiece) are presented above. It should be noted that certain respirators are only applicable to specific types of inhalation exposure. See the OSHA Small Entity Compliance Guide for the Respiratory Protection Standard for detailed descriptions on the respirators corresponding to the APFs in the table.

Any exposure scenarios with risk estimates below the benchmark MOE of 30 are bolded and highlighted.

4.3.3 Risk Estimates for Consumers

Table 4-17 summarizes the dermal, inhalation, ingestion, and aggregate MOEs used to characterize non-cancer risk for acute, intermediate, and chronic exposure to DIBP, and presents these values for all life stages for each COU. A screening level assessment for consumers considers high-intensity exposure scenario risk estimates and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. Using the high-intensity risk estimates will assist in providing health protective approaches. MOEs for high-intensity exposure scenarios are shown for all consumer COUs, while MOEs for medium-intensity exposure scenarios are shown only for COUs with high-intensity MOEs at or below the benchmark of 30.

Further, Table 4-17 provides MOEs for the modeling indoor exposure assessment. The main objective in reconstructing the indoor environment using consumer products and articles commonly present in indoor spaces is to calculate exposure and risk estimates by COU, and by product and article from indoor dust ingestion and inhalation. EPA identified article-specific information by COU to construct relevant and representative exposure scenarios. Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area (>1 m^2) for either a single article or collection of like articles as appropriate. Articles included in the indoor environment assessment included: children's toys (new and legacy), furniture components (textiles), vinyl flooring, carpet tiles, air beds, car mats, in-place wallpaper, shower curtains, and tire crumb. COUs associated with articles included in the indoor environment assessment are indicated with footnotes in Table 4-17.

Of note, the risk summary below is based on the most sensitive, non-cancer endpoint for all relevant duration scenarios (*i.e.*, reduced fetal testicular testosterone production for acute, intermediate, and chronic durations). MOEs for all high-, medium- and low-intensity exposure scenarios for all COUs are described in the *Consumer Risk Calculator for DIBP* (U.S. EPA, 2025g).

COUs with MOEs for High-Intensity Use Exposure Scenarios Above Benchmark

The screening level assessment for consumers considers high-intensity exposure scenario risk estimates, MOEs, and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. If MOEs are above the benchmark of 30 for the high intensity use scenario then any exposures with lower intensity use inputs would result in larger MOEs. Consumer COUs that resulted in MOEs for high-intensity exposure scenarios above the benchmark of 30 for acute, chronic and intermediate exposures are summarized in Table 4-17. Also, consumer COUs that resulted in MOEs for high-intensity exposure scenarios above the benchmark of 30 are in the following list:

- Adhesives and sealants;
- Paints and coatings;
- Plastic and rubber products not covered elsewhere; and
- Toys, playground, and sporting equipment.

Variability in MOEs for these high-intensity exposure scenarios results from use of different exposure factors for each COU and product/article examples that led to different estimates of exposure to DIBP. As described in the *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025g) and *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), EPA has moderate to robust confidence in the exposure estimates and robust confidence in the non-cancer hazard value used to estimate non-cancer risk for these COUs.

COUs with MOEs for High-Intensity Use Exposure Scenarios Below Benchmark

The screening level assessment for consumers considers high-intensity exposure scenario risk estimates, MOEs, and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the estimated exposure distribution. If MOEs are below the benchmark of 30 for the high intensity use scenario, EPA reevaluates the approaches and inputs used and determines if refinement of those is needed. In addition, EPA considers the medium intensity use scenario as either a new possible upper bound estimate by reevaluating inputs and approaches or endeavors in the refinement of approaches by using other modeling tools or other input parameters within the same modeling tools. See Section 2 in *Consumer and Indoor Dust Exposure Assessment for DIBP* (U.S. EPA, 2025g) for details about the consumer modeling approaches, sources of data, model parameterization, and assumptions. Consumer COUs that resulted in MOEs for high-intensity exposure scenarios below the benchmark of 30 for acute, chronic and intermediate exposures are summarized in Table 4-17.

The consumer COUs that resulted in MOEs below the benchmark of 30 are discussed in further detail in the subsections below. The subsection expands on the COU and the aspects driving the MOEs below the benchmark.

Floor Coverings

This section summarizes the risk estimates, MOEs, below the benchmark of 30 for Floor coverings COU. Two different scenarios were assessed under this COU for articles with differing use patterns. The scenarios of vinyl flooring and carpet tiles were evaluated. Both scenarios were part of the indoor assessment and evaluated for all exposure routes except mouthing. Of the two article scenarios assessed for this COU, the acute and chronic inhalation exposure from vinyl flooring resulted in MOEs less than 30 for infants and toddlers for acute and infants for chronic. The acute inhalation, high-intensity exposure scenario MOEs for vinyl flooring were 24 and 25 for infants and toddlers, and the medium-intensity use scenario MOEs were 140 and 120 for infants and toddlers. The chronic inhalation, high-intensity use MOEs for vinyl flooring for infants was 29 and the medium-intensity use scenario MOE for infants was 170.

Vinyl flooring was assessed for DIBP exposure by inhalation, dust ingestion, and dermal exposure routes, but only inhalation resulted in MOEs below 30. In an ECHA proposal for restriction report, DIBP was reported in three vinyl flooring materials at 0.0065, 0.0159, and 0.0571 w/w (Danish EPA, 2011). In a Danish EPA study, DIBP was found in three vinyl flooring materials at weight fractions of 5.6×10^{-5}, 8.13×10^{-4}, and 0.074 w/w (DTI, 2010). EPA used both references weight fraction values for the low-, medium-, and high-intensity exposure scenarios for vinyl flooring were the minimum and maximum values correspond to the low- and high-intensity use scenarios, 5.6×10^{-5} and 0.074 w/w, respectively. The average of all data points, 0.026 w/w, was used for the medium-intensity use scenario.

Key input parameters that control DIBP emission rates (modeled within CEM as part of each scenario simulation) from vinyl flooring in CEM are DIBP physical and chemical properties, weight fraction of DIBP in the material, density of vinyl flooring (g/cm^3), article surface area (m^2), and surface layer thickness (cm). An increase in any of these input parameters results in increased emissions and greater exposure to DIBP. DIBP emissions from vinyl flooring are estimated based on a first order source decay methodology. In inhalation scenarios where DIBP is released from an article, vinyl flooring, into the gas-phase, the article inhalation scenario tracks chemical transport between the source, air, airborne and settled particles, and indoor sinks. The model tracks transport by accounting for emissions, mixing within the gas phase, transfer to particulates by partitioning, removal due to ventilation, removal due to cleaning of settled particulates and dust to which DIBP has partitioned, and sorption or desorption to/from interior surfaces.

Material density was assumed to be a standard value for PVC of 1.4 g/cm^3 in all articles. Values for article surface layer thickness were taken from CEM default values for scenarios with emissions from the same or similar solid material. CEM default values for parameters used to characterize the environment (use volume, air exchange rate, and interzonal ventilation rate) were used for all modeled articles, including vinyl flooring. To estimate surface areas for vinyl flooring, it was assumed that the material was used in 100, 50, and 25 percent of the total floor space. The floor space input value was calculated from the CEM whole house volume (492 m^3) and an assumed ceiling height of 8 ft. The resulting values were used in the high-, medium-, and low-intensity use exposure scenarios, 202, 101, and 50.5 m^2, respectively. EPA has robust confidence that the use of 100 and 50 percent inputs for the total floor space captures actual uses.

For exposure durations, EPA used the stay-at-home activity pattern for this assessment for all scenarios as the most conservative behavior pattern for a screening approach analysis. For the stay-at-home activity pattern used in the vinyl flooring assessment, exposed people are assumed to be in the home the majority of the day (20 hours). CEM default air exchange rates for the building are from the Exposure Factors Handbook (U.S. EPA, 2011a). The default interzonal air flows are a function of the overall air exchange and volume of the building as well as the openness of the room, which is characterized in a regression approach for closed rooms and open rooms (U.S. EPA, 2023b). For vinyl flooring the whole house modeling option was selected, the entire building is considered zone 1, and the interzonal ventilation rate is therefore equal to the negligible value of 1×10^{-30} m^3/hour. EPA has robust confidence in the selected inputs for inhalation exposures from vinyl flooring.

The emissions from vinyl flooring were modeled with a single exponential decay model. This means that the chronic and acute exposure duration scenarios use the same emissions/air concentration data based on the weight fraction of the chemical in the article but have different averaging times. The acute data uses the peak concentration from the simulated 24-hour period, while the chronic uses that same peak concentration data averaged over the entire one-year period. Because air concentrations for most of the year are significantly lower than the peak value, the air concentration used in chronic dose calculations are usually lower than that used to calculate an acute dose. For detailed descriptions of CEM modeling see Emission from Article Placed in Environment in (U.S. EPA, 2023b) and supporting study Little et al. (1994) and ASTM D5116-25. Duration, frequency and surface area of the article have been determined to be key determinants of estimated exposure concentrations according to a sensitivity analysis conducted for CEM input parameters in Appendix C in U.S. EPA (2023b). The overall confidence in this COU inhalation exposure estimate is robust because the CEM input parameters are representative, and the associated uncertainties are well understood.

The inhalation from vinyl flooring high-intensity use exposure scenario resulted in MOEs below 30 for infants and toddlers for acute and infants for chronic durations. This scenario represents infants and toddlers that spend most of their time at home and the entirety of their house flooring contains DIBP. The surface area coverage of vinyl flooring is a sensitive input with significant impact on exposure and risk estimates (U.S. EPA, 2023b). As such, EPA modeled high-, medium-, and low-intensity use exposure scenarios that considers large (100%) to low (25%) surface coverage, and the identified range of vinyl flooring weight fractions (5.6×10^{-5} to 0.074 w/w). Although the high-intensity use exposure scenario is possible it may be an upper-bound estimate and EPA is uncertain and lacks supporting evidence of the widespread use of vinyl flooring coverage in homes. As such, EPA recommends the consideration of the acute and chronic vinyl flooring inhalation medium-intensity use exposure scenarios, which considers a smaller vinyl flooring coverage in homes, 50 percent and a 0.026 w/w DIBP content. The medium- and low-intensity use scenarios allow for the presence of other floor coverings in addition to vinyl flooring, which may be a better representation of average U.S. homes.

Aggregate risk estimates across all evaluated exposure routes, dermal, ingestion, and inhalation exposures to DIBP for vinyl flooring was also considered. The acute, high-intensity use aggregate exposure scenario MOE for toddlers to preschoolers was below the benchmark of 30 and chronic, high-intensity use aggregate for infants and toddlers. The inhalation MOE was the primary contributor to the aggregated MOE value under 30, while ingestion exposures have a relatively lower contribution, but enough to position aggregated results below the benchmark for preschoolers, which were not under the benchmark when considering individual exposure routes for acute exposures and for toddlers when considering individual exposure routes for chronic exposures. See the Aggregate Tab in U.S. EPA (2025g) for the MOE values per exposure route and aggregated results.

Fabric, Textile, and Leather Products Not Covered Elsewhere; Fabric, Textile, and Leather Products Not Covered Elsewhere (e.g., Textile [Fabric] Dyes)

The acute and chronic dermal, high-intensity exposure scenario MOEs for children's clothing range from 16 to 30 for infants to teenagers. The acute and chronic dermal, medium-intensity use MOEs for children's clothing range from 72 to 360 for infants to teenagers.

The High Priority Chemicals Data System (HPCDS) contained data for DIBP measurements in 11 children's clothing items including bodysuits, tops, bottoms, underwear, belts, and variety packs. DIBP was associated with various components including inks/dyes/pigments, synthetic polymers, bio-based materials and textiles (WSDE, 2020). The HPCDS database specified that the targeted age groups for the identified examples were children under 12 years. As such, EPA assessed the exposure to children's clothing for young teens (11 to 15 years) age group and younger. However, there is some uncertainty in the specific type of clothing examples that DIBP could be used based on the database's limited description of the tested items.

For children's clothing the duration of skin contact used in the high- and medium-intensity use scenarios were 480 and 240 minutes respectively, to consider changes of clothing appropriate for young children. The contact area for the high-intensity use scenario corresponded to 50 percent of entire body surface area and 25 percent of face, hands, and arms for the medium-intensity use scenario. For articles for which default input values for duration of use are not available in CEM or the *Exposures Factors Handbook*, professional judgement was used to select the duration of use and article contact for the low, medium, and high exposure scenario levels. Clothing uses have the potential for long durations of dermal contact but may be also used for shorter periods and were thus modeled at 480, 240, and 120 minutes. The identified children's clothing items containing DIBP included tops, bottoms, and underwear, which are likely to be used for 8 hours (480 minutes in the high-intensity use scenarios) or more, but also for shorter periods represented in the medium-intensity use scenario. While the children's clothing examples can be used for longer periods than 8 hours, any increases in skin contact for the 50 percent of entire body surface area, high-intensity use scenario will result in smaller MOEs than the values already showed. See the Dermal calculation tab in U.S. EPA (2025f) for a sensitivity analysis calculation of children's clothing considering various inputs. The medium-intensity use scenario for children's clothing considers 25 percent of face, hands, and arms surface in contact with the clothing item and for 4 hours total. The medium-intensity use children's clothing scenario represent clothing items similar to raincoats and accessories. EPA has a robust confidence that the high- and medium-intensity use scenario inputs accurately represent expected uses.

There is uncertainty with respect to the modeling of dermal absorption of DIBP from solid matrices or articles. EPA has assumed that dermal absorption of DIBP from solid objects would be limited by aqueous solubility of DIBP. There is some uncertainty based on the assumption of migration from solid to aqueous media to skin. EPA has a moderate confidence in the dermal exposure to solid products or articles modeling approach.

As shown in Table 4-17, MOEs for acute dermal exposure to children's clothing containing DIBP are at or below the benchmark of 30 for the high-intensity exposure scenario (8 hours of exposure; 50% of the body surface area in contact with the clothing). The acute and chronic dermal, high-intensity exposure scenario MOEs for children's clothing range from 16 to 30 for infants to teenagers, respectively. For this consumer scenario, dermal doses of 1.9 to 3.5×10^{2} µg/kg/day for the high-intensity exposure scenario across all age groups were derived using a flux-limited approach and a dermal absorptive flux value of 1.7×10^{-4} $mg/cm^2/h$ (U.S. EPA, 2025f). The initial screening-level approach used to calculate dermal exposure (described in detail in Section 2.3 of the consumer technical support document (U.S. EPA, 2025e)) assumes that a saturated aqueous solution of chemical (*i.e.*, concentration of chemical in aqueous solution is equal to water solubility) is available on the surface of the skin. This assumption serves as an upper bound for contact with solid materials. Because of this assumption, the calculation did not consider as inputs the weight fraction of chemical in the clothing or the rate of migration of the chemical out of the clothing.

EPA acknowledges that the screening-level aqueous absorption modeling represents an upper bound of dermal exposure and may result in overestimation of risk. To provide context for the potential degree of overestimation of risk, EPA presents here a refinement of the aqueous absorption model, now considering the diffusion of DIBP out of the clothing and available on the skin for absorption during an exposure event (*i.e.*, DIBP migration from clothing is considered). This additional solid-phase diffusion analysis demonstrates the potential rate of transfer of DIBP from the clothing to the skin, taking into consideration the DIBP concentration and transfer efficiency.

In this analysis EPA used CEM's (U.S. EPA, 2023b) equation for the average distance a diffusing molecule will travel during an exposure event (cm/event), *L*, (Equation 4-3) to obtain the potential rate of transfer of DIBP to the surface of the clothing ($mg/cm^2/h$), *R* (Equation 4-4), during an 8-hour exposure event.

Equation 4-3. Average Distance DIBP Molecule Diffuses During an Exposure Event

$$L = \left(\sqrt{2 \times D \times CF_1 \times Dur}\right) \times CF_2$$

Where,

L	=	Average distance DIBP molecule diffuses during exposure event (cm/event)
D	=	Solid-phase diffusion coefficient from Delmaar et al. (2013), 1×10^{-14} m^2/sec
CF_1	=	Conversion factor, 3600 seconds per hour
Dur	=	Duration of contact per event, 8 h/event
CF_2	=	Conversion factor, 100 cm/m

The solid-phase diffusion coefficient, *D*, is dependent on the chemical and the product material, and specific values for the diffusion coefficient are not generally available. Furthermore, models for estimating solid-phase diffusion coefficients are complex and have limited utility in practical applications (Delmaar et al., 2013). Therefore, the solid-phase diffusion coefficient value was selected from Table 3 in Delmaar et al. (2013). Specifically, available data in Table 3 of Delmaar et al. (2013) were evaluated, with the value selected being chosen to represent a chemical molecular weight closest to DIBP, and an article matrix description that was closest to children's clothing. The study shows that solid-phase diffusion coefficient values decrease with increasing molecular weight. Table 3 in the study lists cedrylacetate (MW = 264 g/mol) and eicosane (MW = 282 g/mol) as having solid-phase diffusion coefficients of 4.1×10^{-14} m^2/s and 6.3×10^{-14} m^2/s, respectively. Consequently, EPA selected to use the order of magnitude 10^{-14} m^2/s provided by both chemicals for DIBP. The chemicals were also reported in polyethylene which is commonly used in the production of plastics. Equation 4-3 and the inputs described were used to calculate the average distance a DIBP molecule diffuses during an exposure event of 8 hours, calculated as $L = 2.4\times10^{-3}$ cm per event. L is then used in Equation 4-4 to calculate the rate of DIBP transfer to the surface of the clothing.

Equation 4-4. Rate of Transfer of DIBP to Surface of Clothing

$$R\ \left({}^{mg}/_{cm^2 hr}\right) = L\left({}^{cm}/_{event}\right) \times \frac{1\ event}{8\ h} \times C\left({}^{mg\ DIBP}/_{cm^3 of\ clothing}\right)$$

Material density was assumed to be a standard value for PVC of 1.4 g/cm^3 in all articles in this risk evaluation, see the consumer technical support document (U.S. EPA, 2025e) and the *Consumer Exposure Analysis for DIBP* (U.S. EPA, 2025f) for calculations and inputs. The reported weight fractions of DIBP in children's clothing in WSDE (2020) ranged from 0.0001 to 0.005 w/w, see U.S. EPA (2025f) for additional detail. The children's clothing data were from 2018 (7 data points) and 2019 (4 data points) period, and the two highest weight fractions were from 2019. The two highest weight fractions were 0.001 w/w and 0.005 w/w, and the remaining 9 data points were an order of magnitude lower. When using the density value of 1.4 g/cm^3 along with the two highest reported DIBP weight fractions in children's clothing (*i.e.*, 0.001 and 0.005 w/w), the concentrations (C) of DIBP in the clothing were calculated as 1.4 and 7 mg/cm^3, respectively. Using these inputs with Equation 4-4, the rates of transfer of DIBP to the clothing surface were calculated as 4.2×10^{-4} $mg/cm^2/h$ for weight fraction of 0.001 w/w and 2.1×10^{-3} $mg/cm^2/h$ for weight fraction of 0.005 w/w. Therefore, for an 8-hour exposure event, weight fractions of 0.001 w/w and 0.005 w/w would result in surface loading values of 3.4 $\mu g/cm^2$ and 16.8 $\mu g/cm^2$, respectively, which are available at the clothing surface for transfer to the skin surface.

EPA also considered the transfer efficiency of DIBP from the clothing surface to the skin surface using the EPA Exposure Factors Handbook (U.S. EPA, 2011a). Specifically, Table 7-27 from the Exposure Factors Handbook provides a summary of measured transfer efficiencies of an applied surface chemical (*i.e.*, riboflavin) from carpet and laminate surfaces to both dry and moist skin under variable surface loading conditions (*i.e.*, 2 $\mu g/cm^2$ for "low loading" and 10 $\mu g/cm^2$ for "high loading"). Results show that transfer efficiencies from material surfaces to moist skin were up to 7.4 percent for "low loading" scenarios and up to 2.7 percent for "high loading" scenarios. There are multiple parameters that affect transfer efficiency like surface loading skin condition, duration of contact, and pressure of contact. According to the Exposure Factors Handbook discussion (U.S. EPA, 2011a), surface loading and skin condition had more impact in characterizing transfer efficiency. Skin condition like dry, moist, and conditions in between will affect transfer efficiency like the surface loading. For this analysis, EPA selected the highest overall transfer efficiencies reported in the Exposure Factors Handbook to demonstrate that even the maximum expected transfer, along with the maximum expected DIBP concentration in clothing resulted in MOEs above the benchmark. Based on comparison of surface loading values from the measured data (*i.e.*, 2 $\mu g/cm^2$ for "low loading" and 10 $\mu g/cm^2$ for "high loading") to the expected surface loading values from the DIBP-containing clothing (*i.e.*, 3.4 $\mu g/cm^2$ for 0.001 w/w clothing and 16.8 $\mu g/cm^2$ for 0.005 w/w clothing), transfer efficiency data from the "low loading" scenarios (*i.e.*, 7.4%) are most representative of the 0.001 w/w clothing and transfer efficiency data from the "high loading" scenarios (*i.e.*, 2.7%) are most representative of the 0.005 w/w clothing.

Using the rates of transfer of DIBP to the clothing surface and the transfer efficiencies from clothing to skin, EPA estimated the potential rate of dermal absorption from higher concentration DIBP-containing clothing items (*i.e.*, 0.001 w/w and 0.005 w/w). It is assumed that all DIBP reaching the skin surface may be absorbed with the limitation that the rate of dermal uptake cannot exceed the rate of aqueous absorption (*i.e.*, 1.7×10^{-4} mg/cm^2/h). For DIBP-containing clothing with a weight fraction of 0.001 w/w, the rate of transfer of DIBP to the clothing surface is estimated as 4.2×10^{-4} mg/cm^2/h and the transfer efficiency from clothing surface to skin surface is estimated as 7.4 percent, resulting in a potential rate of dermal uptake of 3.1×10^{-5} mg/cm^2/h. For DIBP-containing clothing with a weight fraction of 0.005 w/w, the rate of transfer of DIBP to the clothing surface is estimated as 2.1×10^{-3} mg/cm^2/h and the transfer efficiency from clothing surface to skin surface is estimated as 2.7 percent, resulting in a potential rate of dermal uptake of 5.7×10^{-5} mg/cm^2/h. Therefore, for the high intensity exposure scenario (480 minutes of exposure with 50% of body surface area in contact with clothing) with the highest reported weight fraction of DIBP in clothing (*i.e.*, 0.005 w/w), dermal exposure levels across all life stages are estimated to range from 63 to 116 µg/kg/day and associated dermal MOE values are estimated to range from 49 to 90 (Table 4-17).

The screening-level dermal approach originally implemented assumes that absorption of the saturated aqueous material serves as a reasonable upper bound for contact with solid materials. However, the solid-phase diffusion analysis is an additional tiered assessment that accounts for diffusion from the solid matrix to the skin surface. The solid-phase diffusion analysis aims to provide context for the potential degree of overestimation of risk presented by the screening-level aqueous absorption modeling, and EPA has robust confidence in the representation of actual use patterns (*i.e.*, duration of contact and surface area in contact with the skin). Though the initial screening-level assessment for dermal exposure to children's clothing indicated that there may be significant levels of exposure, results of the refined solid-phase diffusion analysis have shown that exposure levels are below the threshold that would indicate risk even for the highest intensity exposure scenario. Further, children may not be expected to experience these conditions on a chronic basis because there is a finite amount of DIBP in clothing, and the amount of DIBP present in clothing with decline with repeated use and washing. However, EPA did not identify any reasonably available information regarding the rate of loss of DIBP from children's clothing. In conclusion, the use of children's clothing is not expected to lead to risk values below the benchmark MOE of 30 for any scenario or population. See consumer technical support document Section 2.3 (U.S. EPA, 2025e) and calculation spreadsheet (U.S. EPA, 2025f) for more details.

Indoor Dust

Exposure to DIBP via ingestion of dust was assessed for all articles expected to contribute significantly to dust concentrations due to high surface area (exceeding ~1 m^2) for either a single article or collection of like articles as appropriate, including furniture components textiles, carpet tiles, vinyl flooring, air beds, car mats, shower curtains, in-place wallpaper, children's toys, both legacy and new, and tire crumb. In a screening assessment for indoor dust ingestion, EPA considered the aggregation of chronic dust ingestion doses (Section 4.1.2.3). However, the indoor assessment was further refined to only consider articles assumed to be present in residential indoor environments because the use of the stay-at-home CEM inputs would result in greater exposures than other non-residential environment options. Articles considered in this indoor assessment include furniture components textiles, carpet tiles, vinyl flooring, in-place wallpaper, shower curtains, and children's toys new and legacy. Car mats, air beds, and tire crumb were considered not to be continuously available in residential indoor environments, as car mats are present in vehicles, air beds tend to be stored away, and tire crumb is present in gyms and outdoor recreational areas. The highest refined aggregated dose from indoor scenario chronic ingestion of settled dust was for preschoolers aged 3 to 5 years and resulted in an MOE of 230. See *Consumer and*

Indoor Exposure Assessment for DIBP (U.S. EPA, 2025e). All other doses were lower and would have resulted in larger MOEs.

4.3.3.1 Overall Confidence in Consumer Risk Estimates for Individual DIBP COUs

As described in Section 4.1.2.4 and in more details in the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e), EPA has moderate and robust confidence in the assessed inhalation, ingestion, and dermal consumer exposure scenarios, and robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP (see Section 4.2 and (U.S. EPA, 2025ad)). The doses used to estimate risk relied on conservative, health protective inputs and parameters that are considered representative of a wide selection of use patterns. Overall, EPA has moderate or robust confidence in the risk estimates calculated for consumers inhalation, ingestion, and dermal exposure scenarios. The overall confidence considers confidence in the approach and the inputs used in the calculations. Sources of uncertainty associated with the three consumer COUs with MOEs less than 30 are discussed above in Section 4.3.3.

Table 4-17. Consumer Risk Summary Table

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Use: Construction, paint, electrical, and metal products: Adhesives and sealants, including fillers and putties	Concrete adhesive	Acute[c]	Dermal	H	–	–	–	–	3.8E03	4.2E03	3.9E03
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	Dermal	H	–	–	–	–	330	360	340
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Chronic	–	–	–	–	–	–	–	–	–
	Wood flooring adhesive	Acute[c]	Dermal	H	–	–	–	–	950	1,000	970
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	43[b]	45[b]	56[b]	71[b]	95	120	140
			Aggregate	H	–	–	–	–	86	110	120
		Intermediate	Dermal	H	–	–	–	–	160	180	170
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	1,300[b]	1,400[b]	1,700[b]	2,100[b]	2,800	3,600	4,200
			Aggregate	H	–	–	–	–	160	180	170
		Chronic	–	–	–	–	–	–	–	–	–
	Sealants for small home repairs	Acute[c]	Dermal	H	–	–	–	–	760	830	780
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	64[b]	68[b]	84[b]	120[b]	130	160	190
			Aggregate	H	–	–	–	–	110	130	150
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	–	–	5.3E03	5.8E03	5.5E03
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	120[b]	130[b]	160[b]	230[b]	250	300	360
			Aggregate	H	–	–	–	–	240	290	340

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	**Toddlers (1–2 years)**	**Preschoolers (3–5 years)**	**Middle Childhood (6–10 years)**	**Young Teens (11–15 years)**	**Teenagers (16–20 years)**	**Adults (21+ years)**
Consumer Use: Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Clothing (children's)	Acute[c]	Dermal	H Screening	**16**	**19**	**21**	**25**	**30**	–	–
				H Refined	49	56	62	74	90	–	–
				M Screening	72	170	220	280	360	–	–
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H Screening	**16**	**19**	**21**	**25**	**30**	–	–
				H Refined	49	56	62	74	90	–	–
				M Screening	72	170	220	280	360	–	–
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Clothing (synthetic leather)	Acute[c]	Dermal	H	–	–	–	–	–[e]	–[e]	–[e]
				M	–	–	–	–	360	400	380
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–[e]	–[e]	–[e]
		Chronic	Dermal	H	–	–	–	–	2.5E03	2.8E03	2.6E03
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Furniture components (textile)	Acute[c]	Dermal	H	–[e]	–[e]	–[e]	–[e]	260	280	270
				M	–[e]	170	220	280	360	400	380
			Ingestion [d]	H	6.50E03	7.50E03	7.90E03	3.00E04	5.30E04	6.70E04	1.50E05
			Inhalation [d]	H	680	720	880	1.30E03	1.80E03	2.10E03	2.60E03
			Aggregate	H	610	660	790	1,200	220	250	240
				M	9,400	170	210	280	360	390	370
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–[e]	–[e]	–[e]	–[e]	260	280	270

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
				M	–[e]	170	220	280	360	400	380
			Ingestion [d]	H	7.10E03	8.40E03	9.00E03	3.60E04	6.40E04	8.10E04	1.80E05
			Inhalation [d]	H	840	890	1.10E03	1.60E03	2.20E03	2.60E03	3.20E03
			Aggregate	H	750	810	980	1,500	230	250	250
				M	11,000	170	210	280	360	390	370
	Small articles with potential for semi–routine contact: bags, belts, headband accessories, and steering wheel cover	Acute[c]	Dermal	H	310	360	420	520	660	720	680
			Ingestion	–	–	–	–	–	–	–	–
			Inhalation	–	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	310	360	420	520	660	720	680
			Ingestion	–	–	–	–	–	–	–	–
			Inhalation	–	–	–	–	–	–	–	–
Consumer Use: Floor coverings	Carpet tiles	Acute[c]	Dermal	H	620	730	840	1,000	1,300	1,400	1,400
			Ingestion [d]	H	1.80E06	1.50E06	1.30E06	3.80E06	6.70E06	8.50E06	1.90E07
			Inhalation [d]	H	1.60E05	1.70E05	2.10E05	3.00E05	4.20E05	4.90E05	6.10E05
			Aggregate	H	620	720	840	1,000	1,300	1,400	1,300
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	620	730	840	1,000	1,300	1,400	1,400
			Ingestion [d]	H	2.20E06	1.80E06	1.60E06	4.50E06	8.10E06	1.00E07	2.30E07
			Inhalation [d]	H	2.00E05	2.10E05	2.60E05	3.70E05	5.20E05	6.10E05	7.60E05
			Aggregate	H	620	720	840	1,000	1,300	1,400	1,300
Consumer Use: Floor coverings	Vinyl flooring	Acute[c]	Dermal	H	1.2E03	1.5E03	1.7E03	2.1E03	2.6E03	2.9E03	2.7E03
			Ingestion [d]	H	280	220	200	560	1.00E03	1.30E03	2.80E03
			Inhalation [d]	M	140	140	180	250	360	420	530
				H	**24**	**25**	31	44	63	74	92
			Aggregate	M	120	120	140	220	310	360	450
				H	**21**	**22**	**26**	40	58	68	86
		Intermediate	–	–	–	–	–	–	–	–	–

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
		Chronic	Dermal	H	1.2E03	1.5E03	1.7E03	2.1E03	2.6E03	2.9E03	2.7E03
			Ingestion[d]	H	330	270	240	680	1.20E03	1.50E03	3.40E03
			Inhalation[d]	M	170	180	220	320	450	520	650
				H	**29**	31	38	55	78	91	110
			Aggregate	M	140	150	180	270	380	440	540
				H	**26**	**27**	32	50	72	84	110
Consumer Use: Paints and coatings	Paints	Acute[c]	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
Consumer Use: Plastic and rubber products not covered elsewhere	Air beds	Acute[c]	Dermal	H	–	–	100	130	170	190	180
			Ingestion[d]	H	5.30E07	4.20E07	3.80E07	1.10E08	1.90E08	2.40E08	5.40E08
			Inhalation[d]	H	2.20E06	2.30E06	2.90E06	4.10E06	5.90E06	6.80E06	8.50E06
			Aggregate	H	2.10E06	2.20E06	100	130	170	190	180
		Intermediate	–	–							
		Chronic	Dermal	H	–	–	1.0E03	1.3E03	1.7E03	1.9E03	1.8E03
			Ingestion[d]	H	6.30E07	5.10E07	4.50E07	1.30E08	2.30E08	2.90E08	6.50E08
			Inhalation[d]	H	2.70E06	2.90E06	3.60E06	5.10E06	7.20E06	8.50E06	1.10E07
			Aggregate	H	2.60E06	2.70E06	1.0E03	1.3E03	1.7E03	1.9E03	1.8E03
	Car mats	Acute[c]	Dermal	H	–	–	–	–	9.3E03	1.0E04	9.6E03
			Ingestion[d]	H	2.00E08	1.60E08	1.50E08	4.00E08	7.00E08	8.70E08	1.80E09
			Inhalation[d]	H	7.70E06	8.20E06	1.00E07	1.40E07	2.10E07	2.40E07	3.00E07
			Aggregate	H	7.40E06	7.80E06	9.40E06	1.40E07	9.3E03	1.0E04	9.6E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	–	–	6.6E04	7.2E04	6.7E04
			Ingestion[d]	H	2.40E08	2.00E08	1.80E08	4.80E08	8.50E08	1.10E09	2.20E09

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Use: Plastic and rubber products not covered elsewhere			Inhalation[d]	H	1.00E07	1.10E07	1.30E07	1.90E07	2.70E07	3.10E07	3.90E07
			Aggregate	H	9.60E06	1.00E07	1.20E07	1.80E07	6.5E04	7.2E04	6.7E04
	Footwear components	Acute[c]	Dermal	H	1.6E03	1.8E03	2.1E03	2.6E03	3.3E03	3.6E03	3.4E03
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	1.6E03	1.8E03	2.1E03	2.6E03	3.3E03	3.6E03	3.4E03
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Shower curtains	Acute[c]	Dermal	H	1.8E03	2.1E03	2.4E03	3.0E03	3.7E03	4.1E03	3.8E03
			Ingestion[d]	H	4.6E06	3.7E06	3.3E06	9.4E06	1.7E07	2.1E07	4.7E07
			Inhalation[d]	H	1.40E05	1.50E05	1.80E05	2.70E05	3.80E05	4.40E05	5.50E05
			Aggregate	H	1.7E03	2.0E03	2.4E03	2.9E03	3.7E03	4.1E03	3.8E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	1.8E03	2.1E03	2.4E03	3.0E03	3.7E03	4.1E03	3.8E03
			Ingestion[d]	H	5.5E06	4.5E06	4.0E06	1.1E07	2.0E07	2.5E07	5.7E07
			Inhalation[d]	H	1.70E05	1.90E05	2.30E05	3.30E05	4.70E05	5.40E05	6.80E05
			Aggregate	H	1.7E03	2.0E03	2.4E03	2.9E03	3.7E03	4.1E03	3.8E03
	Small articles with potential for semi–routine contact: tires and variety PVC articles, bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard	Acute[c]	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–							
		Chronic	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Tire crumb	Acute[c]	Dermal	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Use: Plastic and rubber products not covered elsewhere			Ingestion	H	–	–	9.80E05	2.20E06	4.00E06	1.00E07	1.10E07
			Inhalation	H	–	–	9.10E05	1.40E06	7.00E05	1.30E06	1.40E06
			Aggregate	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	1.60E04	1.70E04	1.20E04	1.40E04	2.30E04
			Ingestion	H	–	–	4.60E06	1.00E07	1.10E07	2.70E07	5.30E07
			Inhalation	H	–	–	4.30E06	6.40E06	1.80E06	3.50E06	6.70E06
			Aggregate	H	–	–	1.50E04	1.60E04	1.20E04	1.40E04	2.30E04
	Wallpaper (in place)	Acute[c]	Dermal	H	1.8E03	2.1E03	2.4E03	3.0E03	3.7E03	4.1E03	–
			Ingestion[d]	H	3.30E04	2.60E04	2.30E04	6.70E04	1.20E05	1.50E05	3.40E05
			Inhalation[d]	H	2.80E03	3.00E03	3.70E03	5.30E03	7.50E03	8.70E03	1.10E04
			Aggregate	H	1.0E03	1.2E03	1.4E03	1.8E03	2.4E03	2.7E03	1.1E04
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	1.8E03	2.1E03	2.4E03	3.0E03	3.7E03	4.1E03	–
			Ingestion[d]	H	3.90E04	3.20E04	2.80E04	8.00E04	1.40E05	1.80E05	4.00E05
			Inhalation[d]	H	3.50E03	3.70E03	4.60E03	6.60E03	9.30E03	1.10E04	1.40E04
			Aggregate	H	1.1E03	1.3E03	1.5E03	2.0E03	2.6E03	2.9E03	1.3E04
	Wallpaper (installation)	Acute[c]	Dermal	H	–	–	–	–	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	–	–	–	–	–	–	–	–	–
Consumer Use: Toys, playground, and sporting equipment	Children's toys (legacy)	Acute[c]	Dermal	H	580	680	790	980	1,200	1,400	–
			Ingestion[d]	H	6.30E03	1.60E04	2.00E04	9.00E04	1.60E05	2.00E05	4.50E05
			Inhalation[d]	H	1.80E03	2.00E03	2.40E03	3.50E03	4.90E03	5.70E03	7.10E03
			Aggregate	H	410	490	580	760	980	1,100	7,000
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	580	680	790	980	1,200	1,400	–
			Ingestion[d]	H	6.50E03	1.70E04	2.30E04	1.10E05	1.90E05	2.40E05	5.40E05

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Use: Toys, playground, and sporting equipment			Inhalation[d]	H	2.30E03	2.40E03	3.00E03	4.30E03	6.10E03	7.10E03	8.80E03
			Aggregate	H	430	520	610	790	1,000	1,100	8,700
	Children's toys (new)	Acute[c]	Dermal	H	580	680	790	980	1,200	1,400	–
			Ingestion[d]	H	7.30E03	2.60E04	4.70E04	9.00E05	1.60E06	2.00E06	4.50E06
			Inhalation[d]	H	1.80E04	2.00E04	2.40E04	3.50E04	4.90E04	5.70E04	7.10E04
			Aggregate	H	520	640	750	950	1,200	1,300	7.0E04
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	580	680	790	980	1,200	1,400	–
			Ingestion[d]	H	7.30E03	2.60E04	4.80E04	1.10E06	1.90E06	2.40E06	5.40E06
			Inhalation[d]	H	2.30E04	2.40E04	3.00E04	4.30E04	6.10E04	7.10E04	8.80E04
			Aggregate	H	530	650	760	960	1,200	1,300	8.7E04
	Small articles with potential for semi–routine contact: variety PVC articles, diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	Acute[c]	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	310	360	420	520	660	720	680
			Ingestion	H	–	–	–	–	–	–	–
			Inhalation	H	–	–	–	–	–	–	–
	Tire crumb	Acute[c]	Dermal	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
			Ingestion	H	–	–	9.80E05	2.20E06	4.00E06	1.00E07	1.10E07
			Inhalation	H	–	–	9.10E05	1.40E06	7.00E05	1.30E06	1.40E06
			Aggregate	H	–	–	3.30E03	3.50E03	4.50E03	5.10E03	5.00E03
		Intermediate	–	–	–	–	–	–	–	–	–
		Chronic	Dermal	H	–	–	1.60E04	1.70E04	1.20E04	1.40E04	2.30E04
			Ingestion	H	–	–	4.60E06	1.00E07	1.10E07	2.70E07	5.30E07
			Inhalation	H	–	–	4.30E06	6.40E06	1.80E06	3.50E06	6.70E06
			Aggregate	H	–	–	1.50E04	1.60E04	1.20E04	1.40E04	2.30E04

[a] Exposure scenario intensities include high (H), medium (M), and low (L), see *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e) for description of exposure scenario intensities and modeling inputs selection. A screening level assessment for consumers considers high-intensity exposure scenario risk estimates and relies on conservative assumptions to assess exposures that would be expected to be on the high end of the expected exposure distribution. MOEs for high-intensity exposure scenarios

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Exposure Scenario (H, M, L)[a]	Life Stage (years) (Benchmark MOE = 30)						
					Infants (<1 year)	Toddlers (1–2 years)	Preschoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)

are shown for all consumer COUs, while MOEs for medium- and low-intensity exposure scenarios are shown only for COUs with high- and low-intensity MOEs at or below the benchmark of 30.

[b] MOE for bystander scenario
[c] Acute scenarios were also considered as part of the CRA. Please see Section 4.4 and Table 4-23 for CRA.
[d] Exposure routes evaluated for indoor environments.
[e] Scenario was deemed to be unlikely; see *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e).
Bold orange background MOE values are at or below the benchmark of 30.

4.3.4 Risk Estimates for General Population Exposed to DIBP through Environmental Releases

EPA utilized previously peer reviewed methodologies to conduct screening level analyses of general population exposure to DIBP associated with TSCA COUs via the ambient air, ambient water, ambient land, and fish ingestion pathways/routes as described in the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v) and Section 4.1.3. This assessment focuses on subsets of the general population in proximity to releasing facilities, including fenceline communities.

EPA evaluated surface water, drinking water, fish ingestion, ambient air, and soil via deposition from ambient air pathways quantitatively. Land pathways (*i.e.*, landfills and application of biosolids) were assessed qualitatively, and were inclusive of down-the-drain disposal of consumer products and landfill disposal of consumer articles (see Section 3.1.3 for details on the qualitative assessment of consumer disposal of DIBP-containing products and articles). For pathways assessed quantitatively, EPA used high-end estimates of DIBP concentration in the various environmental media for screening level purposes. EPA used a MOE approach using high-end exposure estimates with the human health POD to determine whether an exposure pathway had potential non-cancer risks. High-end exposure estimates were defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations. If there is no risk for an individual identified as having the potential for the highest exposure for a COU and given pathway of exposure, then EPA determined that the pathway was not a pathway of concern and the pathway was not further evaluated. If any pathways were identified as a pathway of concern for the general population, further exposure assessments for that pathway would be conducted to include higher tiers of modeling, if available, additional subpopulations and COUs. Risk estimates for the screening analysis for the various pathways assessed quantitatively are described in Section 4.1.3.

No estimated MOEs were below the benchmark MOE of 30, even under very conservative exposure scenarios for exposure through surface water, drinking water, ambient air, and soil via air deposition. For fish ingestion exposure, MOEs were below the benchmark for the Application of paints and coatings OES, which discharges to multiple media types. EPA conservatively assumed 100 percent discharge to surface water for scenarios with releases to multiple meadia types, but EPA only has slight confidence in MOEs for the multimedia OESs without information to proportion what fraction is released to water, as described further in Section 4.1.3. For Plastic compounding OES, a water-only release, there were no MOEs below the benchmark from fish ingestion even with conservative assumptions including no wastewater treatment and high releases into a low flow waterbody. Therefore, using a screening level approach described in Section 4.1.3, exposure to DIBP through biosolids, landfills, surface water, drinking water, fish ingestion, ambient air, and soil via deposition from ambient air, were not determined to be pathways of concern for any COU listed in Table 3-1.

4.3.4.1 Overall Confidence in General Population Risk

As described in Sections 3.3.1.1 and 4.1.3.3 and in more technical detail in the *Draft Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v), EPA has robust confidence that modeled releases used for the screening level analysis are appropriately conservative for a screening level analysis. Therefore, EPA has robust confidence that no exposure scenarios will lead to greater exposures than presented in this evaluation. Despite moderate confidence in the estimated values themselves, confidence in exposure estimates capturing high-end exposure scenarios was robust given the conservative assumptions used for the estimates. Along with EPA's robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP (see Section 4.2 and (U.S. EPA, 2025ad)), EPA has robust confidence that the risk estimates calculated for the general population were conservative and appropriate for a screening level analysis.

4.3.5 Risk Estimates for Potentially Exposed or Susceptible Subpopulations

EPA considered PESS throughout the exposure assessment and throughout the hazard identification and dose-response analysis supporting the draft DIBP risk evaluation.

Some population group life stages may be more susceptible to the health effects of DIBP exposure. As discussed in Section 4.2 and in EPA's *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad) and *Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ap), exposure to DIBP causes adverse effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome in experimental animal models. Therefore, females of reproductive age, pregnant women, male infants, male children, and male adolescents are considered to be susceptible subpopulations. These susceptible life stages were considered throughout the risk evaluation. For example, females of reproductive age were evaluated for occupational exposures to DIBP for each COU (Section 4.3.2). Additionally, infants (<1 year), toddlers (1–2 years), preschoolers (3–5 years), middle school children (6–10 years), young teens (11–15 years), and teenagers (16–20 years) were evaluated for exposure to DIBP through consumer products and articles (Section 4.3.3). EPA also considered cumulative phthalate exposure and risk for female workers of reproductive age, as well as male children and female consumers of reproductive age. Additionally, the Agency used a value of 10 for the UF_H to account for human variability. The Risk Assessment Forum, in *A Review of the Reference Dose and Reference Concentration Processes*, discusses some of the evidence for choosing the default factor of 10 when data are lacking—including toxicokinetic and toxicodynamic factors as well as greater susceptibility of children and elderly populations (U.S. EPA, 2002b).

The available data suggest that some groups or life stages have greater exposure to DIBP. This includes people exposed to DIBP at work, those who frequently use consumer products and/or articles containing high concentrations of DIBP, those who may have greater intake of DIBP per body weight (*e.g.,* infants, children, adolescents) leading to greater exposure. EPA accounted for these populations with greater exposure in the DIBP risk evaluation as follows:

- EPA evaluated a range of OESs for workers and ONUs, including high-end exposure scenarios for females of reproductive age (a susceptible subpopulation) and average adult workers.
- EPA evaluated a range of consumer exposure scenarios, including high-intensity exposure scenarios for infants and children (susceptible subpopulations). These populations had greater intake per body weight.
- EPA evaluated a range of general population exposure scenarios, including high-end exposure scenarios for infants and children (susceptible subpopulations). These populations had greater intake per body weight.
- EPA evaluated exposure to DIBP through fish ingestion for subsistence fishers and Tribal populations.
- EPA aggregated occupational inhalation and dermal exposures for each COU for females of reproductive age (a susceptible subpopulation) and average adult workers.
- EPA aggregated consumer inhalation, dermal, and oral exposures for each COU for infants and children (susceptible subpopulations).
- EPA evaluated cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP for the U.S. civilian population using NHANES urinary biomonitoring data and reverse dosimetry for females of reproductive age (aged 16–49 years) and male children (aged 3–5, 6–11, and 12–15 years).

- For females of reproductive age, black non-Hispanic women had slightly higher 95th percentile cumulative exposures to DEHP, DBP, BBP, DIBP, and DINP compared to women of other races (*e.g.*, white non-Hispanic, Mexican America). The 95th percentile cumulative exposure estimate for black non-Hispanic women served as the non-attributable national cumulative exposure estimate used by EPA to evaluate cumulative risk to workers and consumers.

4.4 Cumulative Risk Considerations

EPA developed a *Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ap) (CRA TSD) for the CRA of six toxicologically similar phthalates being evaluated under section 6 of TSCA: di(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), dicyclohexyl phthalate (DCHP), DIBP, and diisononyl phthalate (DINP). EPA previously issued a *Draft Proposed Approach for Cumulative Risk Assessment of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (draft 2023 approach), which outlined an approach for this assessment (U.S. EPA, 2023c). EPA's proposal was subsequently peer reviewed by the Science Advisory Committee on Chemicals (SACC) in May 2023 (U.S. EPA, 2023e), while EPA's CRA TSD (U.S. EPA, 2025ap) was peer-reviewed by the SACC in August 2025 (U.S. EPA, 2025al). In the 2023 draft approach, EPA identified a cumulative chemical group and PESS [15 U.S.C. § 2605(b)(4)]. Based on toxicological similarity and induced effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome, EPA proposed a cumulative chemical group of DEHP, BBP, DBP, DCHP, DIBP, and DINP—but not diisodecyl phthalate (DIDP). This approach emphasizes a uniform measure of hazard for sensitive subpopulations, namely females of reproductive age and/or male infants and children, however additional health endpoints are known for broader populations and described in the individual non-cancer human health hazard assessments for DEHP (U.S. EPA, 2025ac), DBP (U.S. EPA, 2025aa), DIBP (U.S. EPA, 2025ad), BBP (U.S. EPA, 2025z), DCHP (U.S. EPA, 2025ab), and DINP (U.S. EPA, 2025ae), including hepatic, kidney, and other developmental and reproductive toxicity.

The Agency's approach for assessing cumulative risk is described in detail in the CRA TSD (U.S. EPA, 2025ap) and incorporates feedback from the SACC (U.S. EPA, 2023e) on EPA's 2023 draft proposal (U.S. EPA, 2023c), as well as feedback from the SACC received during the August 2025 peer-review meeting of phthalates (U.S. EPA, 2025al). EPA is focusing its CRA on acute duration exposures of females of reproductive age, male infants, and male children to six toxicologically similar phthalates (*i.e.*, DEHP, DBP, BBP, DIBP, DCHP, DINP) that induce effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome. The Agency is further focusing its CRA on acute duration exposures because there is evidence that effects on the developing male reproductive system consistent with a disruption of androgen action can result from a single exposure during the critical window of development (see Section 1.5 of (U.S. EPA, 2025ap) for further details). To evaluate cumulative risk, EPA is using a relative potency factor (RPF) approach. RPFs for DEHP, DBP, BBP, DIBP, DCHP, and DINP were developed using a meta-analysis and benchmark dose (BMD) modeling approach based on a uniform measure (*i.e.*, reduced fetal testicular testosterone). EPA is also using NHANES data to supplement—not substitute—evaluations for exposure scenarios for TSCA COUs to provide non-attributable, total exposure for addition to the relevant scenarios presented in the individual risk evaluations.

The analogy of a "risk cup" is used throughout this document to describe cumulative exposure estimates. The risk cup term is used to help conceptualize the contribution of various phthalate exposure routes and pathways to overall cumulative risk estimates and serves primarily as a communication tool. The term/concept describes exposure estimates where the full cup represents the total exposure that leads to risk (cumulative MOE) and each chemical contributes a specific amount of exposure that adds a finite amount of risk to the cup. A full risk cup indicates that the cumulative MOE has dropped below the benchmark MOE (*i.e.,* total UF), whereas cumulative MOEs above the benchmark indicate that only a percentage of the risk cup is full.

The remainder of the human health CRA is organized as follows:

- Section 4.4.1 – Describes the approach used by EPA to derive RPFs for DEHP, DBP, BBP, DIBP, DCHP, and DINP based on reduced fetal testicular testosterone, which are used by EPA as part of the current CRA and to assess exposures to individual phthalates by scaling to an index chemical (RPF analysis). Section 2 of EPA's CRA TSD (U.S. EPA, 2025ap) provides more details.
- Section 4.4.2 – Briefly describes the approach used by EPA to calculate cumulative non-attributable phthalate exposure for the U.S. population using NHANES urinary biomonitoring and reverse dosimetry. Section 4 of EPA's CRA TSD (U.S. EPA, 2025ap) provides additional details.
- Section 4.4.3 – Describes two approaches used by EPA to combine exposures to DIBP from individual consumer and occupational COUs/OES with cumulative non-attributable phthalate exposures from NHANES to estimate cumulative risk. Empirical examples demonstrating application of both approaches are also provided. Section 5 of EPA's CRA TSD (U.S. EPA, 2025ap) provides additional details.
- Sections 4.4.4 through 4.4.6 – Summarize risk estimates for workers, consumers, and the general population based on relative potency assumptions using the two approaches described in Section 4.4.3.

For additional details regarding EPA's CRA, readers are directed to the following TSDs:

- *Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* (U.S. EPA, 2025ap);
- *Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* (U.S. EPA, 2025y);
- *Draft Proposed Approach for Cumulative Risk Assessment of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c);
- *Draft Proposed Principles of Cumulative Risk Assessment under the Toxic Substances Control Act* (U.S. EPA, 2023d);
- *Science Advisory Committee on Chemicals Meeting Minutes and Final Report, No. 2023-01 – A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Draft Proposed Principles of Cumulative Risk Assessment (CRA) Under the Toxic Substances Control Act and a Draft Proposed Approach for CRA of High-Priority Phthalates and a Manufacturer-Requested Phthalate* (U.S. EPA, 2023e); and
- *Science Advisory Committee on Chemicals (SACC) meeting minutes and final report – Peer Review of the Draft Risk Evaluations of Dibutyl phthalate (DBP), Di(2-ethylhexyl) phthalate (DEHP), and Dicyclohexyl phthalate (DCHP), and the Technical Support Documents for Butylbenzyl phthalate (BBP) and Diisobutyl phthalate (DIBP)* (U.S. EPA, 2025al).

4.4.1 Hazard Relative Potency

This section briefly summarizes the RPF approach used by EPA to evaluate phthalates for cumulative risk. Section 4.4.1.1 provides a brief overview and background for the RPF approach methodology, while Section 4.4.1.2 provides a brief overview of the RPFs derived by EPA for DEHP, DBP, BBP, DIBP, DCHP, and DINP based on decreased fetal testicular testosterone. Further details regarding the analysis conducted by EPA are provided in the following two TSDs:

- *Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* (U.S. EPA, 2025ap); and
- *Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP)* (U.S. EPA, 2025y).

4.4.1.1 Relative Potency Factor Approach Overview

For the RPF approach, chemicals being evaluated require (1) data that support toxicologic similarity (*e.g.*, components of a mixture share a known or suspected common MOA or share a common apical endpoint/effect); and (2) have dose-response data for the effect of concern over similar exposure ranges (U.S. EPA, 2023a, 2000, 1986). RPF values account for potency differences among chemicals in a mixture and scale the dose of one chemical to an equitoxic dose of another chemical (*i.e.*, the index chemical). The chemical selected as the index chemical is often among the best characterized toxicologically and considered to be representative of the type of toxicity elicited by other components of the mixture. Implementing an RPF approach requires a quantitative dose-response assessment for the index chemical and pertinent data that allow the potency of the mixture components to be meaningfully compared to that of the index chemical. In the RPF approach, RPFs are calculated as the ratio of the potency of the individual component to that of the index chemical using either (1) the response at a fixed dose, or (2) the dose at a fixed response (Equation 4-5)Equation 4-5.

Equation 4-5. Calculating RPFs

$$RPF_i = \frac{BMD_{R-IC}}{BMD_{R-i}}$$

Where:

BMD	=	Benchmark dose (mg/kg/day)
R	=	Magnitude of response (*i.e.*, benchmark response)
i	=	i^{th} chemical
IC	=	Index chemical

After scaling the chemical component doses to the potency of the index chemical, the scaled doses are summed and expressed as index chemical equivalents for the mixture (Equation 4-6).

Equation 4-6. Calculating Index Chemical Equivalents

$$Index\ Chemical\ Equivalents_{MIX} = \sum_{i=1}^{n} d_i \times RPF_i$$

Where:

Index chemical equivalents	=	Dose of the mixture in index chemical equivalents (mg/kg/day)
d_i	=	Dose of the i^{th} chemical in the mixture (mg/kg/day)

RPF_i	=	Relative potency factor of the i[th] chemical in the mixture (unitless)

Non-cancer risk associated with exposure to an individual chemical or the mixture can then be assessed by calculating an MOE, which in this case is the ratio of the index chemical's non-cancer hazard value (*e.g.*, the BMDL) to an estimate of exposure expressed in terms of index chemical equivalents. The MOE is then compared to the benchmark MOE (*i.e.*, the total uncertainty factor associated with the assessment) to characterize risk.

4.4.1.2 Relative Potency Factors

Derivation of RPFs

To derive RPFs for DEHP, DBP, BBP, DIBP, DCHP, and DINP, EPA utilized a meta-analysis and BMD modeling approach similar to that used by NASEM (2017) to model decreased fetal testicular testosterone. As described further in EPA's *Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for DEHP, DBP, BBP, DIBP, and DCHP* (U.S. EPA, 2025y), the Agency evaluated benchmark responses (BMRs) of 5, 10, and 40 percent using Metafor Version 4.6.0 and 2.0.0. EPA estimated RPFs at the 5, 10, and 40 percent response levels. However, RPFs could not be estimated for BBP at the 5 or 10 percent response levels or for DIBP at the 5 percent response level because BMDs could not be estimated for BBP or DIBP at these response levels due to lack of data at the low-end range of the dose-response curve using Metafor Version 4.6.0. Therefore, for input into the CRA of phthalates, EPA has selected RPFs using BMD_{40} estimates, as this was the only response level in which a full set of RPFs could be derived for all phthalates being evaluated (Table 4-18).

There is some uncertainty in the applicability of the selected RPFs for DIBP and BBP at the low response levels (*i.e.*, 5–10% changes). However, the lack of variability in calculated RPFs for DEHP (RPFs ranged from 0.82–0.84), DCHP (RPFs ranged from 1.66–1.71), and DINP (RPFs ranged from 0.19–0.21) across response levels, and the fact that the RPF for DIBP was 0.53 at both the 10 and 40 percent response levels, increases EPA's confidence in the selected RPFs for BBP and DIBP. Furthermore, during the August 2025 phthalate peer-review meeting (U.S. EPA, 2025al), SACC recommended that EPA consider use of the older Metafor Version 2.0.0 BMD modeling results as an alternative to calculate RPFs based on decreased fetal testicular testosterone because Metafor Version 2.0.0 allowed BMD_5, BMD_{10}, and BMD_{40} estimates to be derive for DEHP, DBP, BBP, DIBP, DCHP, and DINP. As described in Section 2.4 of the CRA TSD (U.S. EPA, 2025ap), RPFs calculated using BMD_5 estimates from Metafor Version 2.0.0 were similar (within 5–10% for DEHP, BBP, DCHP, DINP; 20% for DIBP) to the selected RPFs calculated using BMD_{40} estimates from Metafor Version 4.6.0, which further increases EPA's confidence in the selected RPFs.

For input into the CRA of phthalates under TSCA, EPA is using RPFs calculated using BMD_{40} estimates using Metafor Version 4.6.0 shown in Table 4-18.

For further details regarding RPFs derivation, see Section 2 of EPA's *Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ap).

Table 4-18. Relative Potency Factors Based on Decreased Fetal Testicular Testosterone

Phthalate	BMD_{40} (mg/kg-day)	RPF Based on BMD_{40}
DBP (Index chemical)	149	**1.0**
DEHP	178	**0.84**
DIBP	279	**0.53**
BBP	284	**0.52**
DCHP	90	**1.66**
DINP	699	**0.21**

Selection of the Index Chemical

As described further in Section 2 of EPA's CRA TSD (U.S. EPA, 2025ap), *EPA has selected DBP as the index chemical*. Notably, the SACC agreed with EPA's selection of DBP as the index chemical during the August 2025 phthalate peer-review meeting (U.S. EPA, 2025al). DBP has a high-quality toxicological database of studies demonstrating effects on the developing male reproductive system consistent with a disruption of androgen action and phthalate syndrome. Furthermore, studies of DBP demonstrate toxicity representative of all phthalates in the cumulative chemical group and DBP is well characterized for the MOA associated with phthalate syndrome. Finally, compared to other phthalates, including well-studied phthalates such as DEHP, DBP has the most dose-response data available in the low-end range of the dose-response curve where the BMD_5 and $BMDL_5$ are derived, which provides a robust and scientifically sound foundation of BMD and BMDL estimates on which the RPF approach is based.

Index Chemical POD

As with any risk assessment that relies on BMD analysis, the POD is the lower confidence limit used to mark the beginning of extrapolation to determine risk associated with human exposures. As described further in the non-cancer human health hazards of DEHP (U.S. EPA, 2025ac), DBP (U.S. EPA, 2025aa), BBP (U.S. EPA, 2025z), DIBP (U.S. EPA, 2025ad), DCHP (U.S. EPA, 2025ab), and DINP (U.S. EPA, 2025ae) (see Appendices titled "Considerations for Benchmark Response (BMR) Selection for Reduced Fetal Testicular Testosterone" in each hazard assessment), EPA has reached the conclusion that a BMR of 5 percent is the most appropriate and health protective response level for evaluating decreased fetal testicular testosterone as the basis of the POD (as noted above, RPFs are based on a 40% response level). For the index chemical, DBP, the $BMDL_5$ for the best fitting linear-quadratic model is 9 mg/kg-day for reduced fetal testicular. Using allometric body weight scaling to the ¾-power (U.S. EPA, 2011c), EPA extrapolated an HED of 2.1 mg/kg-day to use as the POD for the index chemical in the CRA.

Selection of the Benchmark MOE

Consistent with Agency guidance (U.S. EPA, 2022c, 2002b), EPA selected an intraspecies uncertainty factor (UF_H) of 10, which accounts for variation in susceptibility across the human population and the possibility that the available data might not be representative of individuals who are most susceptible to the effect. EPA used allometric body weight scaling to the three-quarters power to derive an HED of 2.1 mg/kg-day DBP, which accounts for species differences in toxicokinetics. Consistent with EPA Guidance (U.S. EPA, 2011c), the interspecies uncertainty factor (UF_A), was reduced from 10 to 3 to account remaining uncertainty associated with interspecies differences in toxicodynamics. Overall, a total uncertainty factor of 30 was selected for use as the benchmark margin of exposure for the CRA (based on an interspecies uncertainty factor [UF_A] of 3 and an intraspecies uncertainty factor [UF_H] of 10).

Weight of Scientific Evidence
EPA has selected an HED of 2.1 mg/kg-day ($BMDL_5$ of 9 mg/kg-day) as the index chemical (DBP) POD. This POD is based on a meta-analysis and BMD modeling of decreased fetal testicular testosterone data from eight studies of rats gestationally exposed to DBP. The Agency has also derived RPFs of 1, 0.84, 0.53, 0.52, 1.66, and 0.21 for DBP (index chemical), DEHP, DIBP, BBP, DCHP, and DINP, respectively, based on a common toxicological outcome (*i.e.*, reduced fetal testicular testosterone). EPA has robust overall confidence in the selected POD for the index chemical (*i.e.*, DBP) and the derived RPFs.

Application of RPF provides a more robust basis for assessing the dose-response to the common hazard endpoint across all assessed phthalates. For DIBP and a subset of the phthalates with a more limited toxicological dataset, scaling by the RPF and application of the index chemical POD provides a more sensitive and robust hazard assessment than the chemical-specific POD. Readers are directed to EPA's CRA TSD (U.S. EPA, 2025ap) for a discussion of the weight of evidence supporting EPA's conclusions.

4.4.2 Cumulative Phthalate Exposure: Non-Attributable Cumulative Exposure to DEHP, DBP, BBP, DIBP, and DINP Using NHANES Urinary Biomonitoring and Reverse Dosimetry

This section briefly summarizes EPA's approach and results for estimating non-attributable cumulative exposure to phthalates using NHANES urinary biomonitoring data and reverse dosimetry. Readers are directed to Section 4 of EPA's CRA TSD (U.S. EPA, 2025ap) for additional details.

NHANES is an ongoing exposure assessment of the U.S. population's exposure to environmental chemicals using biomonitoring. The NHANES biomonitoring dataset is a national, statistical representation of the general, non-institutionalized, civilian U.S. population. CDC's NHANES dataset provides an estimate of average aggregate exposure to individual phthalates for the U.S. population. However, exposures measured via NHANES cannot be attributed to specific sources, such as TSCA COUs or other sources. Given the short half-lives of phthalates, neither can NHANES capture acute, low frequency exposures. Instead, as concluded by the SACC review of the draft 2023 approach, NHANES provides a "snapshot" or estimate of total, non-attributable phthalate exposure for the U.S. population and relevant subpopulations (U.S. EPA, 2023e). These estimates of total non-attributable exposure can supplement assessments of scenario-specific acute risk in individual risk evaluations.

EPA used urinary phthalate metabolite concentrations for DEHP, DBP, BBP, DIBP, and DINP measured in the most recently available NHANES survey (2017–2018) to estimate the average daily aggregate[10] intake of each phthalate through reverse dosimetry for

- Females of reproductive age (16–49 years);
- Male children (4 to <6 years, used as a proxy for male infants and toddlers);
- Male children (6–11 years); and
- Male children (12 to <16 years).

[10] EPA defines *aggregate exposure* as the "combined exposures to an individual from a single chemical substance across multiple routes and across multiple pathways" (40 CFR section 702.33).

Aggregate daily intake values for each phthalate were then scaled by relative potency using the RPFs in Table 4-18, expressed in terms of index chemical (DBP) equivalents, and summed to estimate cumulative daily intake in terms of index chemical (DBP) equivalents using the approach outlined in Sections 4.4.1 and 4.4.3.

Because EPA is focusing its CRA on acute exposure durations, EPA selected 95th percentile exposure estimates from NHANES to serve as the non-attributable nationally representative exposure estimate for use in its CRA. For females of reproductive age, EPA's analysis indicates that black, non-Hispanic women have slightly higher 95th percentile cumulative phthalate exposure compared to other racial groups; thus, 95th percentile cumulative exposure estimates for black non-Hispanic females of reproductive age was selected for use in the CRA of DIBP (Table 4-19).

The 95th percentile of national cumulative exposure serves as the estimate of non-attributable phthalate exposure for its CRA of DIBP as follows:

- Females of reproductive age (16–49 years, black Non-Hispanic): 5.16 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to worker and consumer females of reproductive age in Section 4.4.4 and Section 4.4.5.
- Males (3–5 years): 10.8 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to consumer male infants (<1 year), toddlers (1–2 years), and preschoolers (3–5 years) in Section 4.4.5. Since NHANES does not include urinary biomonitoring for infants (<1 year) or toddlers (1–2 years), and other national datasets are not available, EPA used biomonitoring data from male children (3 to <6 years) as a proxy for male infants and toddlers.
- Males (6–11 years): 7.35 µg/kg-day index chemical (DBP) equivalents This serves as the non-attributable contribution to consumer male children (6–10 years) in Section 4.4.5.
- Males (12–15 years): 4.36 µg/kg-day index chemical (DBP) equivalents. This serves as the non-attributable contribution to consumer male teenagers (11–15 years) in Section 4.4.5.

4.4.2.1 Weight of Scientific Evidence: Non-Attributable Cumulative Exposure to Phthalates

Overall, EPA has robust confidence in the derived estimates of non-attributable cumulative exposure from NHANES urinary biomonitoring using reverse dosimetry.

The Agency EPA used urinary biomonitoring data from the CDC's national NHANES dataset, which provides a statistical representation of the general, non-institutionalized, civilian U.S. population. To estimate daily intake values from urinary biomonitoring for each phthalate, EPA used reverse dosimetry. The reverse dosimetry approach used by EPA has been used extensively in the literature and has been used by the U.S. CPSC (2014) and Health Canada (Health Canada, 2020) to estimate phthalate daily intake values from urinary biomonitoring data. However, given the short half-lives of phthalates, NHANES biomonitoring data are not expected to capture low frequency exposures and may be an underestimate of acute phthalate exposure.

Table 4-19. Cumulative Phthalate Daily Intake (µg/kg-day) Estimates for Females of Reproductive Age, Male Children, and Male Teenagers from the 2017–2018 NHANES Cycle

Population	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30)[a]
Females (16–49 years; Race: black non-Hispanic; n = 371)	50	DBP	0.10	1	0.10	15.0	0.667	3,151	1.0%
		DEHP	0.38	0.84	0.32	47.9			
		BBP	0.04	0.52	0.02	3.1			
		DIBP	0.15	0.53	0.08	11.9			
		DINP	0.70	0.21	0.15	22.1			
	95	DBP	0.48	1	0.48	9.3	5.16	407	7.4%
		DEHP	4.28	0.84	3.60	69.7			
		BBP	0.30	0.52	0.16	3.0			
		DIBP	0.40	0.53	0.21	4.1			
		DINP	3.40	0.21	0.71	13.8			
Males (3–5 years; n = 267)	50	DBP	0.56	1	0.560	18.4	3.04	690	4.3%
		DEHP	2.11	0.84	1.77	58.2			
		BBP	0.22	0.52	0.114	3.76			
		DIBP	0.57	0.53	0.302	9.93			
		DINP	1.4	0.21	0.294	9.66			
	95	DBP	2.02	1	2.02	18.6	10.8	194	15.5%
		DEHP	6.44	0.84	5.41	49.9			
		BBP	2.46	0.52	1.28	11.8			
		DIBP	2.12	0.53	1.12	10.4			
		DINP	4.8	0.21	1.01	9.30			
Males (6–11 years; n = 553)	50	DBP	0.38	1	0.380	20.1	1.89	1,111	2.7%
		DEHP	1.24	0.84	1.04	55.1			
		BBP	0.16	0.52	0.083	4.40			
		DIBP	0.33	0.53	0.175	9.26			
		DINP	1	0.21	0.210	11.1			

Population	Percentile	Phthalate	Aggregate Daily Intake (µg/kg-day)	RPF	Aggregate Daily Intake in DBP Equivalents (µg/kg-day)	% Contribution to Cumulative Exposure	Cumulative Daily Intake (DBP Equivalents, µg/kg-day)	Cumulative MOE (POD = 2,100 µg/kg-day)	% Contribution to Risk Cup (Benchmark = 30)[a]
	95	DBP	1.41	1	1.41	19.2	7.35	286	10.5%
		DEHP	4.68	0.84	3.93	53.5			
		BBP	0.84	0.52	0.437	5.94			
		DIBP	1.62	0.53	0.859	11.7			
		DINP	3.4	0.21	0.714	9.71			
Males (12–15 years; n = 308)	50	DBP	0.33	1	0.330	27.6	1.19	1,758	1.7%
		DEHP	0.66	0.84	0.554	46.4			
		BBP	0.14	0.52	0.073	6.09			
		DIBP	0.21	0.53	0.111	9.32			
		DINP	0.6	0.21	0.126	10.5			
	95	DBP	0.62	1	0.620	14.2	4.36	482	6.2%
		DEHP	2.51	0.84	2.11	48.3			
		BBP	0.64	0.52	0.333	7.63			
		DIBP	0.59	0.53	0.313	7.17			
		DINP	4.7	0.21	0.987	22.6			

[a] A cumulative exposure of 70 µg DBP equivalents/kg-day would result in a cumulative MOE of 30 (*i.e.*, 2,100 µg DBP-equivalents/kg-day ÷ 70 µg DBP equivalents/kg-day = 30), which is equivalent to the benchmark of 30, indicating that the exposure is at the threshold for risk. Therefore, to estimate the percent contribution to the risk cup, the cumulative exposure expressed in DBP equivalents is divided by 70 µg DBP equivalents/kg-day to estimate percent contribution to the risk cup.

4.4.3 Estimation of Cumulative Risk

As described in the CRA TSD (U.S. EPA, 2025ap), EPA is focusing its exposure assessment for the CRA for DIBP on evaluation of exposures through individual TSCA consumer and occupational DIBP COUs as well as non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data and reverse dosimetry.

As described in the *Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP under TSCA* (U.S. EPA, 2025ap), EPA considered two approaches for characterizing cumulative risk. During the 2025 peer-review meeting for phthalates, SACC concluded that both approaches have strengths and uncertainties, but that the two approaches can complement one another and that EPA should present both approaches and select the most scientifically defensible approach for the final individual risk characterization and decision making process (U.S. EPA, 2025al). Based on SACC recommendations, EPA has considered both cumulative risk characterization approaches in this risk evaluation.

For the first approach, all phthalate exposures are scaled by relative potency using the RPFs presented in Table 4-20 to express phthalate exposure in terms of index chemical (DBP) equivalents. Exposures from individual DIBP consumer or worker COUs/OES were then combined with non-attributable cumulative exposure (from NHANES) to estimate cumulative exposure and cumulative risk using the index chemical (DBP) POD. Cumulative risk for the first approach was estimated using the four-step process outlined in Section 5.1 of the CRA TSD (U.S. EPA, 2025ap), along with two empirical examples of how EPA calculated cumulative risk using Approach 1. For the second approach, individual phthalate exposures for consumer and occupational COUs are not scaled by RPFs but use the individual phthalate hazard values and are combined with non-attributable cumulative exposures estimated using NHANES. Cumulative risk for the second approach was estimated using the four-step process outlined in Section 5.1 of the CRA TSD (U.S. EPA, 2025ap), along with two empirical examples of how EPA calculated cumulative risk using Approach 2.

Table 4-20 provides a comparison of similarity and differences between Approaches 1 and 2, while Section 4.4.3.1 below provides an overview of the similarities and differences between the two approaches, as well as a discussion of the strengths, limitations, and uncertainties associated with both approaches, and the approach selected by EPA for estimating cumulative risk in the final risk characterization and for use in decision making.

Table 4-20. Comparison of CRA Approaches 1 and 2

Steps for Calculating the Cumulative Risk	Approach 1	Approach 2
Step 1: Exposure estimates for the individual phthalates individual TSCA COUs	Individual exposures scaled by relative potency and expressed in index chemical (DBP) equivalents	Individual exposures not scaled by relative potency
Step 2: Estimate non-attributable cumulative exposure	No differences between approaches	
Step 3: Calculate the MOEs for each exposure to the individual phthalate	Individual MOEs calculated using the index chemical (DBP) POD	Individual MOEs calculated using the individual phthalate POD
Step 4: Calculate the cumulative MOE	No differences between approaches	

4.4.3.1 Comparison of Two Approaches for Estimating Cumulative Risk

Based on SACC recommendations, EPA has considered both cumulative risk characterization approaches in each individual phthlate risk evaluation. To determine which approach is most scientifically defensible for use in the final risk characterization and decision making for each individual phthalate, EPA considered the strengths, limitations, and uncertainties of underlying dose-response data supporting both approaches for each phthalate included in the CRA. To support transparent and consistent decision making, EPA developed a framework that outlines key considerations used by EPA to determine the most scientifically defensible approach for the contribution of cumulative risk to the individual risk characterization for each phthalate (Table 4-21). Because non-attributable cumulative exposure and risk from NHANES biomonitoring data is factored into Approaches 1 and 2 in the same manner, non-attributable cumulative exposure and risk from NHANES is not a factor that contributes to differences in cumulative risk estimates between the two approaches. Instead, differences between the two approaches stem from how exposure estimates from each individual phthalate COU are handled. For Approach 1, exposure estimates from individual consumer or occupational COUs are scaled by relative potency, expressed in index chemical equivalents, and the index chemical POD is used to calculate risk. For Approach 2, exposure estimates from individual consumer or occupational COUs are not scaled by relative potency, and the individual phthalate POD is used to calculate risk for each individual COU, resulting in risk estimates identical to those calculated in the individual phthalate risk assessment. Therefore, there are two primary factors that contribute to how closely cumulative risk estimates align between Approaches 1 and 2: the RPF for each phthalate and the POD selected for each individual phthalate, see Table 4-21.

Table 4-21. Considerations for Determining Confidence in Cumulative Risk Estimates For CRA Approaches 1 and 2

Factor	Consideration
Dose-Response Data Supporting RPF Derivation	• Quantity and quality of fetal testicular testosterone dose-response data • Availability of dose-response data in the low-end range of the dose-response curve (*i.e.*, doses below those eliciting a 40% response) • Similarity of candidate RPFs across 5, 10, and 40% response levels (*i.e.*, consideration of the parallelism) • Similarity of BMD results obtained via different approaches (*i.e.*, meta-analysis and/or BMD modeling of individual data sets using EPA's BMDS)
Dose-Response Data Supporting the Individual Phthalate POD	• Quantity and quality of dose-response data supporting the POD, whether it be a NOAEL (*i.e.*, for DEHP, BBP, DCHP) or $BMDL_5$ (*i.e.*, for DBP, DIBP, DINP) • For DEHP, BBP, and DCHP, the dose-range between the NOAEL and LOAEL • Comparison of BMD modeling and NOAEL/LOAEL approaches

As discussed in Section 4 of the CRA TSD (U.S. EPA, 2025ap), application of Approach 1 for DIBP leads to cumulative risk estimates that are approximately 1.5× to 1.7× more sensitive than risk estimates in the individual DIBP risk evaluation, while application of Approach 2 leads to risk estimates that are approximately 1.1× to 1.2× more sensitive than in the individual DIBP risk evaluation. The reason for the difference in cumulative risk estimates between the two approaches is because the RPF of 0.53 based on reduced fetal testicular testosterone content (used in Approach 1) indicates DIBP is 47 percent less potent than DBP, while the difference between the index chemical (DBP) POD of 2.1 mg/kg-day (used in Approach 1) and DIBP POD of 5.7 mg/kg-day (used in Approach 2) indicates DIBP is 63 percent less potent than the index chemical (DBP). These small differences in relative potency (*i.e.,* 47 vs. 63 percent) lead to the differences in risk estimates between Approaches 1 and 2. The strengths, limitations, and uncertainties of the dose-response data supporting derivation of the DIBP RPF and the DIBP POD is provided below.

Dose-Response Data Supporting RPF Derivation

- *Quantity and quality of fetal testicular testosterone dose-response data.* The DIBP RPF of 0.53 is derived from the ratio of the DBP BMD_{40} to the DIBP BMD_{40} for reduced fetal testicular testosterone (*i.e.,* 149÷279 mg/kg-day = 0.53). The DIBP RPF was estimated via meta-analysis and BMD analysis of fetal testicular testosterone data from three studies (2 high- and 1 medium-quality) (Gray et al., 2021; Hannas et al., 2011; Howdeshell et al., 2008).
- *Availability of dose-response data in the low-end range of the dose-response curve (i.e., doses below those eliciting a 40% response)*. One source of uncertainty associated with the meta-analysis and BMD analysis of DIBP is that there are limited testosterone data available for DIBP in the low-end range of the dose response curve. The lowest dose evaluated in all three of the available studies of DIBP was 100 mg/kg-day, while BMD_{10} and BMD_{40} estimates from the meta-analysis are 55 and 279 mg/kg-day, respectively (U.S. EPA, 2025y). Additionally, no BMD_5 estimate could be derived for DIBP via the meta-analysis approach.
- *Similarity of candidate RPFs across 5, 10, 40 percent response levels (i.e., consideration of the parallelism)*. Candidate RPFs for DIBP were identical at the 10 and 40 percent response levels (*i.e.,* RPFs were 0.53 at both response levels). Because no BMD_5 estimate could be derived for DIBP, no candidate RPF could be derived for DIBP at the 5 percent response level. There is some uncertainty in how representative the RPF of 0.53 derived at the 40 and 10 percent response levels is of the response at the 5 percent response level. However, this is somewhat addressed by the lack of variability in RPFs at the 10 and 40 percent response levels, indicating parallel dose-response curves. Further candidate RPFs for DEHP, DCHP, and DINP did not vary significantly across the 5, 10, and 40 percent response levels, indicating parallel dose-response curves for these phthalates as well. This indicates that the selected RPF of 0.53 for DIBP derived from the 40 percent response level is expected to provide a reasonable estimate of potency at the 5 percent response level, increasing EPA's confidence in the selected RPF.
- *Similarity of BMD results obtained via different approaches.* EPA also conducted BMD modeling of fetal testicular testosterone data from each individual study included in the meta-analysis using EPA's BMD Software (BMDS Version 3.3.2). One benefit of this analysis is that BMDS includes a broader suite of models compared to those included in the meta-analysis approach (*i.e.,* Exponential, Hill, Polynomial, Power, Linear models vs. linear and linear-quadratic models in the meta-analysis). As discussed further in the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), BMD analysis of individual datasets provided BMD/BMDL estimates generally consistent with the meta-analysis approach. For example, BMD_{40} estimates were 335 mg/kg-day from the best-fitting Exponential 3 model (Gray et al., 2021) and 298 mg/kg-day from the best-fitting Hill model (Howdeshell et al., 2008) versus 279 mg/kg-day from the best-fitting linear-quadratic model in the meta-analysis.

Dose-Response Data Supporting the Individual Phthalate POD

- *Quantity and quality of dose-response data supporting the POD*. The DIBP POD is an HED of 5.7 mg/kg-day and is derived from a $BMDL_5$ of 24 mg/kg-day based on reduced fetal testicular testosterone from one high-quality study (Gray et al., 2021). One uncertainty associated with the DIBP POD is that the $BMDL_5$ of 24 mg/kg-day is below the lowest dose of 100 mg/kg-day included in the study by Gray et al. (2021). However, there are no studies of DIBP that have evaluated doses below 100 mg/kg-day. Given the lack of studies of evaluating doses of DIBP less than 100 mg/kg-day, EPA considered the POD derived from the BMD analysis of data in the study by Gray et al. to have the least uncertainty and highest confidence upon examination of the weight of scientific evidence (U.S. EPA, 2025ad). Notably, the SACC supported EPA's selection of a $BMDL_5$ of 24 mg/kg-day from Gray et al. (2021) for use as the basis for the POD and had no concerns for EPA's BMD modeling approach, given the lack of studies evaluating doses of DIBP less than 100 mg/kg-day (U.S. EPA, 2025al).
- *Comparison of BMD modeling and NOAEL/LOAEL approaches.* As discussed in the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad), four gestational exposure studies (3 high- and 1 medium-quality) of DIBP support a narrow range of NOAEL and LOAEL values of 100 and 125 mg/kg-day, respectively, for phthalate syndrome related effects (Gray et al., 2021; Hannas et al., 2011; Howdeshell et al., 2008; Saillenfait et al., 2008). The selected $BMDL_5$ of 24 mg/kg-day is below the lowest NOAEL of 100 mg/kg-day. However, as discussed above, there are no studies of DIBP that have evaluated doses below 100 mg/kg-day, and although the $BMDL_5$ estimate below the lowest dose with empirical data, EPA considers the BMD analysis of data in the study by Gray et al. to have the least uncertainty and highest confidence upon examination of the weight of scientific evidence (U.S. EPA, 2025ad).

Based on the weight of scientific evidence considerations outlined in the developed framework Table 4-21, EPA has weighed the strengths and uncertainties associated with the DIBP RPF (Approach 1) and the DIBP POD (Approach 2 and individual DIBP risk evaluation). EPA has concluded that the strengths and uncertainties of both approaches are well balanced. Both approaches are health-protective, science-based, and align with input from SACC. MOEs from Approach 2 will be used to characterize cumulative risk for DIBP, simplifying the risk characterization as it is more consistent with the single chemical assessment.

4.4.4 Cumulative Risk Estimates for Workers

This section summarizes cumulative risk estimates for female workers of reproductive age from acute duration exposures to DIBP. EPA focused its occupational cumulative risk assessment on this population and exposure duration because as described in Section 4.4 and the CRA TSD (U.S. EPA, 2025ap), this population and exposure duration is considered most directly applicable to the common hazard outcome that serves as the basis for the cumulative analysis (*i.e.*, phthalate syndrome-related effects).

To evaluate cumulative risk to female workers of reproductive age, EPA combined inhalation and dermal exposures to DIBP from each individual occupational COU/OES with non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP (estimated from NHANES biomonitoring data). For the Approach 2 (described further in Section 4.4.3), exposures from individual DIBP OES were not scaled by RPFs, but instead remained in units of exposure of mg/kg-day DIBP. MOEs were then calculated using exposures from individual DIBP OES and the DIBP POD and combined with the non-attributable cumulative MOE (from NHANES, with all exposures expressed in index chemical (DBP) equivalents).

As discussed previously in Section 4.3.2.3, OSHA and NIOSH both recommend a hierarchy of controls to address hazardous exposures in the workplace. OSHA and NIOSH recommend the use of PPE (*e.g.*, respirators, gloves) as the last means of control, when the other control measures cannot reduce workplace exposure to an acceptable level. Cumulative MOEs for female workers of reproductive age are presented in Table 4-22 and the *Occupational and Consumer Cumulative Risk Calculator for DIBP* (U.S. EPA, 2025af) and assume no PPE use. For COUs with acute cumulative MOEs below the cumulative benchmark of 30, corresponding PPE required to raise the cumulative MOE above the benchmark are also presented.

4.4.4.1 Cumulative Risk Characterization – Approach 2

Since DIBP inhalation and dermal exposures are not scaled by RPFs for Approach 2, the only factor contributing to slightly lower cumulative MOEs is the addition of non-attributable cumulative exposure from NHANES. As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data from the 2017 to 2018 survey (most recent dataset available) and reverse dosimetry (see Section 4.4.2 and (U.S. EPA, 2025ap) for further details), representing exposure to a national population. DCHP was not included as part of the cumulative non-attributable national exposure estimate because DCHP has not been included in NHANES analyses since 2011 due to low frequencies of detection and low detection levels in urine (Section 4.4.2). Non-attributable cumulative exposure estimates were scaled by relative potency and expressed in index chemical (DBP) equivalents. Non-attributable cumulative exposure was then combined with acute inhalation and dermal DIBP exposures for each individual OES scaled by relative potency. For female workers of reproductive age, EPA added a non-attributable cumulative exposure of 5.16 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE. This non-attributable cumulative exposure estimate is the 95th percentile estimate for black non-Hispanic females of reproductive age (16–49 years). *This non-attributable cumulative exposure contributes approximately 7.4 percent to the risk cup with a benchmark MOE of 30.* Overall, EPA has robust confidence in the non-attributable cumulative exposure estimate since it was calculated from CDC's NHANES biomonitoring dataset, which provides a statistically representative sampling of the U.S. civilian population. Furthermore, the Agency used a well-established reverse dosimetry approach to calculate phthalate daily intake values from urinary biomonitoring data.

Using Approach 2, high-end acute cumulative MOEs for female workers of reproductive age ranged from 35 to 183 (cumulative benchmark = 30) for 16 out of 19 OES (Table 4-22) and (U.S. EPA, 2025af)). For these 16 OES the addition of cumulative risk using would have no impact on risk conclusions. For the remaining 3 OES (*i.e.*, Rubber compounding, Spray application of paints and coatings, and Spray application of adhesives and sealants), high-end and/or central tendency MOEs for female workers of reproductive age were below the benchmark of 30 in the individual DIBP assessment (listed below). Addition of non-attributable cumulative national exposure (from NHANES) would have no impact on high-end or central tendency risk conclusions for these three OES.

- Application of paints and coatings – spray application (high-end and central tendency inhalation [1.9 and 122], dermal [98 and 197,] and aggregate [1.8 and 75] MOEs (Table 4-16); high-end and central tendency cumulative MOEs = 1.8 and 64, respectively (Table 4-22));
- Application of adhesives and sealants – spray application (high-end and central tendency inhalation [1.9 and 20], dermal [98 and 197], and aggregate [1.8 and 18] MOEs (Table 4-16); high-end and central tendency cumulative MOEs = 1.8 and 18, respectively (Table 4-22)); and
- Rubber compounding (high-end and central tendency inhalation [41 and 413], dermal [98 and 197], and aggregate [29 and 133] MOEs (Table 4-16); high-end and central tendency cumulative MOEs = 27 and 100, respectively (Table 4-22).

4.4.4.2 Overall Confidence in Cumulative Worker Risk Estimates

As described in Section 4.1.1.4 and the *Environmental Release and Occupational Exposure Assessment for DIBP* (U.S. EPA, 2025w), EPA has moderate confidence in the inhalation and dermal exposures estimates for the assessed OESs. As discussed above in Section 4.4.3.1, EPA has weighed the strengths and uncertainties associated with the DIBP RPF (Approach 1) and the DIBP POD (Approach 2 and individual DIBP risk evaluation). EPA has concluded that the strengths and uncertainties of both approaches are well balanced. Both approaches are health-protective, science-based, and align with input from SACC. EPA selected Approach 2 to characterize cumulative risk for DIBP, simplifying the risk characterization as it is more consistent with the single chemical assessment.

Table 4-22. Acute Cumulative MOE Summary Table for Female Workers of Reproductive Age Using Approach 2

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute Cumulative MOE (Dermal Exposure from COU + Inhalation Exposure from COU + Non-Attributable Cumulative Exposure from NHANES)[a] (Benchmark = 30)	Respirator APF to get Cumulative MOE Above the Benchmark of 30
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	HE	76	–
			CT	131	–
Manufacturing – Importing	Importing	Repackaging into large and small containers	HE	76	–
Processing – Repackaging	Repackaging (*e.g.*, laboratory chemicals)		CT	131	–
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Adhesive manufacturing;	Incorporation into adhesives and sealants	HE	76	–
			CT	131	–
Processing – Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	HE	76	–
			CT	131	–
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Formulation into pre-catalyst	HE	76	–
			CT	131	–
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Intermediate in polypropylene manufacturing	HE	76	–
			CT	131	–

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute Cumulative MOE (Dermal Exposure from COU + Inhalation Exposure from COU + Non-Attributable Cumulative Exposure from NHANES)[a] (Benchmark = 30)	Respirator APF to get Cumulative MOE Above the Benchmark of 30
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Plastic product manufacturing	Plastic compounding	HE	76	–
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings		CT	131	–
	Processing aids, not otherwise listed				–
Processing – Incorporation into article	Plasticizers in: – Plastic product manufacturing; transportation equipment manufacturing	Plastics converting	HE	70	–
			CT	226	–
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber compounding	HE	**27**	APF = 5
	Foam pipeline pigs		CT	100	–
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber converting	HE	35	–
	Foam pipeline pigs		CT	195	–
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings – spray application	HE	**1.8**	APF = 50
Commercial Use – Paints and coatings	Paints and coatings		CT	64	–

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute Cumulative MOE (Dermal Exposure from COU + Inhalation Exposure from COU + Non-Attributable Cumulative Exposure from NHANES)[a] (Benchmark = 30)	Respirator APF to get Cumulative MOE Above the Benchmark of 30
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings – non-spray application	HE	76	–
Commercial Use – Paints and coatings	Paints and coatings		CT	131	–
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants – spray application	HE	**1.8**	APF = 50
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives		CT	**18**	APF = 5
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants – non-spray application	HE	76	–
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives		CT	131	–
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (liquids)	HE	76	–
			CT	131	–
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	HE	183	–
			CT	255	–
Processing – Recycling	Recycling	Recycling	HE	44	–
			CT	193	–
Disposal – Disposal	Disposal		HE	44	–

Life Cycle Stage – Category	Subcategory	OES	Exposure Level	Acute Cumulative MOE (Dermal Exposure from COU + Inhalation Exposure from COU + Non-Attributable Cumulative Exposure from NHANES)[a] (Benchmark = 30)	Respirator APF to get Cumulative MOE Above the Benchmark of 30
		Waste handling, treatment, and disposal	CT	193	–
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	HE	71	–
Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)		CT	204	–
Commercial Use – Toys, playground, and sporting equipment	Toys, playground, and sporting equipment				

[a] The acute cumulative MOEs for Approaches 1 and 2 are derived by summing inhalation exposure from each individual DIBP COU with dermal exposure from the same DIBP COU and the cumulative non-attributable exposure to DEHP, DBP, BBP, DIBP, and DINP as described in Section 4.4.3. Non-attributable cumulative exposure was estimated from NHANES urinary biomonitoring data using reverse dosimetry.
Any exposure scenario with risk estimates below the benchmark MOE of 30 are bolded and highlighted.

4.4.5 Cumulative Risk Estimates for Consumers

This section summarizes cumulative risk estimates for consumers from acute duration exposures to DIBP. EPA focused its CRA on females of reproductive age and male infants and children. EPA focused its consumer CRA on these populations for the acute exposure duration because, as described in Section 4.4 and (U.S. EPA, 2025ap), these populations and exposure duration are considered most directly applicable to the common hazard outcome that serves as the basis for the cumulative assessment (*i.e.*, reduced fetal testicular testosterone). For consumers, EPA did not specifically evaluate females of reproductive age or male infants and children; however, consumer exposures of teenagers (16–20 years) and adults (21+ years) were considered a proxy for females of reproductive age, while infants (<1 year), toddlers (1–2 years), children (3–5 and 6–10 years), and young teens (11–15 years) were considered a proxy for male infants and children.

To evaluate cumulative risk to consumers, EPA combined inhalation, dermal, and ingestion exposures to DIBP from each individual consumer COU and product/article exposure scenario with non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP (estimated from NHANES urinary biomonitoring using reverse dosimetry). For Approach 2 (described further in Section 4.4.3), exposures from individual DIBP OES were not scaled by RPFs, but instead remained in units of exposure of mg/kg-day DIBP. MOEs were then calculated using exposures from individual DIBP OES and the DIBP POD and combined with the non-attributable cumulative MOE (from NHANES, with all exposures expressed in index chemical (DBP) equivalents).

Cumulative MOEs calculated using Approach 2 are shown in Table 4-23 and the *Occupational and Consumer Cumulative Risk Calculator for DIBP* (U.S. EPA, 2025af).

4.4.5.1 Cumulative Risk Characterization – Approach 2

Since DIBP inhalation and dermal exposures are not scaled by RPFs for Approach 2, the only factor contributing to slightly lower cumulative MOEs is the addition of non-attributable cumulative exposure from NHANES. As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data from the 2017 to 2018 survey (most recent dataset available) and reverse dosimetry (see Section 4.4.2 and (U.S. EPA, 2025ap) for further details), representing exposure to a national population. DCHP was not included as part of the cumulative non-attributable national exposure estimate because DCHP has not been included in NHANES analyses since 2011 due to low frequencies of detection and low detection levels in urine (Section 4.4.2). Non-attributable cumulative exposure estimates were scaled by relative potency and expressed in index chemical (DBP) equivalents. Non-attributable cumulative exposure was then combined with acute inhalation, ingestion, and dermal DIBP exposures for each individual consumer COU. For infants, toddlers, and preschoolers, EPA added a non-attributable cumulative exposure of 10.8 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 15.5 percent to the risk cup with a benchmark MOE of 30. For middle-aged children, EPA added a non-attributable cumulative exposure of 7.35 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 10.5 percent to the risk cup with a benchmark MOE of 30. For young teens (11−15 years), EPA added a non-attributable cumulative exposure of 4.36 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 6.2 percent to the risk cup with a benchmark MOE of 30. For teenagers (16−20 years) and adults (21+ years), EPA added a non-attributable cumulative exposure of 5.15 µg/kg index chemical (DBP) equivalents to calculate the cumulative MOE, which contributes 7.4 percent to the risk cup with a benchmark MOE of 30. Overall, EPA has robust confidence in the non-attributable cumulative exposure estimate since it was calculated from CDC's NHANES biomonitoring dataset, which provides a statistically representative sampling of the U.S. civilian population. Furthermore, the Agency used a well-established reverse dosimetry approach to calculate phthalate daily intake values from urinary biomonitoring data.

Using Approach 2, high-intensity acute cumulative MOEs ranged from 35 to 458 for 20 of the 22 assessed consumer product or article examples (cumulative benchmark = 30) (Table 4-23 and (U.S. EPA, 2025af)). Two consumer product or article examples (*i.e.*, Children's clothing and Vinyl flooring) had high-intensity cumulative MOEs below the benchmark of 30. For vinyl flooring, high-intensity cumulative MOEs ranged from 14 to 26 for infants (less than 1 year), toddlers (1–2 years), and children (3–10 years) and ranged from 37 to 52 for all other age groups, while medium-intensity cumulative MOEs ranged from 117 to 449 for all age groups. As previously discussed in Section 4.3.3, high-intensity (but not medium-intensity) aggregate MOEs were below the bench benchmark of 30 for multiple age groups in the individual DIBP risk assessment (Section 4.3.3). Because MOEs were already below the benchmark of 30 in the individual DIBP assessment (Section 4.3.3), the addition of cumulative risk has no impact on risk conclusions for the vinyl flooring exposure scenario.

For children's clothing, high-intensity cumulative MOEs ranged from 15 to 28 for all assessed age groups (infants less than 1 year, toddlers 1–2 years children 3–15 years of age), while medium-intensity cumulative MOEs ranged from 53 to 207 for all assessed age groups (Table 4-23). As discussed in Section 4.3.3, EPA conducted an additional solid-phase diffusion analysis of the dermal flux values associated with the children's clothing exposure scenario and considered the transfer efficiency of DIBP from the clothing surface to the skin surface using the EPA Exposure Factors Handbook (U.S. EPA, 2011a). This refined analysis, which utilized the highest DIBP weight fraction in children's clothing of 0.005 w/w and a transfer efficiency of 2.7 percent resulted in high-intensity cumulative MOEs ranging from 39 for infants (less than one year) to 76 for young teens (11 to 15 years), compared to a cumulative benchmark of 30.

4.4.5.2 Overall Confidence in Cumulative Consumer Risks

As described in Section 4.1.2.4 and in more technical details in the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e), EPA has moderate and robust confidence in the inhalation, ingestion, and dermal exposures estimates for the assessed consumer exposure scenarios. As discussed above in Section 4.4.3.1, EPA has weighed the strengths and uncertainties associated with the DIBP RPF (Approach 1) and the DIBP POD (Approach 2 and individual DIBP risk evaluation). EPA has concluded that the strengths and uncertainties of both approaches are well balanced. Both approaches are health-protective, science-based, and align with input from SACC. EPA selected Approach 2 to characterize cumulative risk for DIBP, simplifying the risk characterization as it is more consistent with the single chemical assessment.

Table 4-23. Consumer Acute Cumulative MOE Summary Table for CRA Approach 2

Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) [a]	Life stage (Years) Acute Cumulative MOE (Dermal exposure from COU + Inhalation exposure from COU + ingestion exposure from COU + Non-Attributable Cumulative Exposure from NHANES) (Benchmark MOE = 30)						
			Infant (<1 year)	**Toddler (1–2 years)**	**Preschooler (3–5 years)**	**Middle Childhood (6–10 years)**	**Young Teen (11–15 years)**	**Teenager (16–20 years)**	**Adult (21+ years)**
Consumer Use: Construction, paint, electrical, and metal products: Adhesives and sealants, including fillers and putties	Concrete adhesive	H	–	–	–	–	428	371	369
	Wood flooring adhesive	H	35 [d]	37 [d]	43 [d]	57 [d]	73	85	94
	Sealants for small home repairs	H	48 [d]	51 [d]	59 [d]	85 [d]	90	100	111
Consumer Use: Fabric, textile, and leather products not covered elsewhere: Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Clothing (children's)	H	**15 [c]**	**17 [c]**	**19 [c]**	**23 [c]**	**28 [c]**	–	–
		M	53	90	102	142	207	–	–
	Clothing (synthetic leather)	M	–	–	–	–	207	201	195
	Furniture components (textile)	H	148	150	156	231	152	154	151
	Small articles with potential for semi-routine contact: bags, belts, headband accessories, and steering wheel cover	H	120	127	133	185	279	260	254
Consumer Use: Floor coverings: Floor coverings	Carpet tiles	H	148	153	158	224	353	317	313
	Vinyl flooring	H	**19 [c]**	**20 [c]**	**23 [c]**	35	52	58	71
		M	73	75	83	124	189	192	214
Consumer Use: Paints and coatings: Paints and coatings	Paints	H	120	127	133	185	279	260	254

Life Cycle Stage: COU: Subcategory	Product or Article	Exposure Level (H, M, L) [a]	Life stage (Years) Acute Cumulative MOE (Dermal exposure from COU + Inhalation exposure from COU + ingestion exposure from COU + Non-Attributable Cumulative Exposure from NHANES) (Benchmark MOE = 30)						
			Infant (<1 year)	**Toddler (1–2 years)**	**Preschooler (3–5 years)**	**Middle Childhood (6–10 years)**	**Young Teen (11–15 years)**	**Teenager (16–20 years)**	**Adult (21+ years)**
Consumer Use: Plastic and rubber products not covered elsewhere: Plastic and rubber products not covered elsewhere	Air beds	H	194	194	66	90	125	127	122
	Car mats	H	194	194	194	286	458	391	390
	Footwear components	H	173	176	178	258	420	366	363
	Shower curtains	H	175	177	180	260	426	370	368
	Small articles with potential for semi-routine contact: tires and variety PVC articles, bathtub applique, phone charger, garden hose, feeding mat, hobby cutting boards, tape, paper packaging products, folding boxboard	H	120	127	133	185	279	260	254
	Tire crumbs	H	–	–	184	264	435	377	376
	Wallpaper (in place)	H	164	167	170	247	402	354	392
	Wallpaper (installation)	H	–	–	–	–	279	260	254
Consumer Use: Toys, playground, and sporting equipment: Toys, playground, and sporting equipment	Children's toys (legacy)	H	132	139	145	207	323	296	385
	Children's toys (new)	H	142	149	154	220	344	311	405
	Small articles with potential for semi-routine contact: variety PVC articles, diving goggles, exercise ball, yoga mats, pet chew toys, jump rope, footballs	H	120	127	133	185	279	260	254
	Tire crumb	H	–	–	193	282	474	402	402

Bolded text and orange background indicates MOE values at or below the benchmark of 30.
[a] Exposure scenario intensities include high (H), medium (M), and low (L).
[b] MOEs for this age group <30 in the cumulative assessment, but not the individual DIBP risk assessment.
[c] MOEs for this age group <30 in both the cumulative and individual DIBP risk assessment.
[d] MOE for bystander scenario.
Any exposure scenario with risk estimates below the benchmark MOE of 30 are bolded and highlighted.

4.4.6 Cumulative Risk Estimates for the General Population

For DIBP, EPA did not evaluate cumulative risk for the general population from environmental releases. As discussed in Section 4.1.3, the Agency employed a screening level approach to assess risk from exposure to DIBP for the general population from environmental releases. Using this conservative screening level approach, EPA did not identify any pathways of concern, indicating that refinement was not necessary. However, as discussed in Section 4.4.2, EPA did evaluate cumulative exposure and risk from exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data. The NHANES biomonitoring dataset is a national, statistical representation of the general, non-institutionalized, civilian U.S. population and provides estimates of average aggregate exposure to individual phthalates for the U.S. population. As can be seen from Table 4-19, and as discussed in more detail in the *Technical Support Document for the Cumulative Risk Analysis of DEHP, DBP, BBP, DIBP, DCHP, and DINP Under TSCA* (U.S. EPA, 2025ap), 95th percentile cumulative MOEs ranged from 194 to 592 (cumulative benchmark = 30) for females of reproductive age and male children. These MOEs indicate that the risk cup is 6.2 to 15.5 percent full and indicate that cumulative exposure to DEHP, DBP, DIBP, BBP, and DINP, based on the most recent NHANES survey data (2017–2018), does not currently pose a risk to most male children or pregnant women within the U.S. civilian population.

4.5 Comparison of Single Chemical and Cumulative Risk Assessments

In support of the developed CRA, EPA has relied substantially on existing CRA-related work by the Agency's Risk Assessment Forum (RAF), EPA Office of Pesticide Programs (OPP), the Organisation for Economic Co-operation and Development (OECD), the European Commission, and the World Health Organization (WHO) and International Programme on Chemical Safety (IPCS), including:

- *Guidelines for the Health Risk Assessment of Chemical Mixtures* (U.S. EPA, 1986);
- *Guidance for Identifying Pesticide Chemicals and Other Substances that Have a Common Mechanism of Toxicity* (U.S. EPA, 1999);
- *Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures* (U.S. EPA, 2000);
- *General Principles for Performing Aggregate Exposure and Risk Assessments* (U.S. EPA, 2001);
- *Guidance on Cumulative Risk Assessment of Pesticide Chemicals that Have a Common Mechanism of Toxicity* (U.S. EPA, 2002a);
- *Framework for Cumulative Risk Assessment* (U.S. EPA, 2003);
- *Concepts, Methods and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures, and Effects: A Resource Document* (U.S. EPA, 2007a);
- *Pesticide Cumulative Risk Assessment: Framework for Screening Analysis Purpose* (U.S. EPA, 2016b);
- *Advances in Dose Addition For Chemical Mixtures: A White Paper* (U.S. EPA, 2023a).
- *Phthalates and Cumulative Risk Assessment: The Tasks Ahead* (NRC, 2008);
- *State of the Art Report on Mixture Toxicity* (Kortenkamp et al., 2009);
- *Risk Assessment of Combined Exposure to Multiple Chemicals: A WHO/IPCS Framework* (Meek et al., 2011); and
- *Considerations for Assessing the Risks of Combined Exposure to Multiple Chemicals* (OECD, 2018).

Herein, EPA has evaluated risks for workers (Section 4.3.2), consumers (Section 4.3.3), and the general population (Section 4.3.4) from exposure to DIBP alone, as well as cumulative risks for workers (Section 4.4.4) and consumers (Section 4.4.5) using Approach 2 that take into account cumulative non-attributable exposure to DEHP, DBP, BBP, DIBP, and DINP from NHANES biomonitoring and reverse dosimetry.

There are several notable differences between the individual DIBP assessment (Section 4.3) and the CRA (Section 4.4). As part of the individual DIBP assessment (Section 4.3), EPA considered all human health hazards of DIBP and selected a POD based on a $BMDL_5$ for reduced fetal testicular testosterone to characterize risk from exposure to DIBP. As part of its exposure assessment in the individual DIBP assessment, EPA considered acute, intermediate, and chronic exposures durations for a broad range of populations—including female workers of reproductive age, average adult workers, ONUs, the general population, and consumers of various life stages (*e.g.*, infants, toddlers, children, adults). Furthermore, in the individual DIBP assessment, EPA evaluated inhalation and dermal exposures to workers, as well as consumer exposure to DIBP via the inhalation, dermal, and ingestion exposure routes. In contrast, the CRA, which involves estimating cumulative risk using two approaches (Section 4.4.3), is more focused in scope (Section 4.4). For example, the CRA is focused on acute duration exposures and the most sensitive populations (*i.e.*, women of reproductive age, male infants, male children). As discussed in Section 4.4.3.1, EPA has concluded that the strengths and uncertainties of both approaches are well balanced. Both approaches are health-protective, science-based, and align with input from SACC. MOEs from Approach 2 were used to characterize cumulative risk for DIBP, simplifying the risk characterization as it is more consistent with the single chemical assessment. For Approach 2, DIBP exposures were not scaled by relative potency but instead use the individual DIBP POD and are combined with non-attributable cumulative exposures for each phthalate estimated using NHANES (Section 4.4.3).

Both the individual DIBP assessment (Section 4.3) and the CRA using Approach 2 (Section 4.4) led to similar conclusions regarding risk estimates for workers and consumers. For workers, no cumulative acute high-end MOEs were less than the benchmark of 30 for OES that did not already have an MOE less than 30 in the individual DIBP assessment. For consumers, no acute cumulative MOEs were less than 30 for the 22 product and article examples that did not already have an MOE less than 30 in the individual DIBP assessment (Section 4.3.3). Overall, one factor influenced the differences in risk estimates between the individual DIBP assessment and the CRA using Approach 2 (Section 4.4.4.1), which was the addition of non-attributable cumulative exposure. As part of its CRA, EPA calculated non-attributable cumulative exposure to DEHP, DBP, BBP, DIBP, and DINP using NHANES urinary biomonitoring data from the 2017 to 2018 survey reverse dosimetry (Section 4.4.2), representing exposure to a national population. Overall, this non-attributable cumulative exposure contributes approximately 6.2 to 15.5 percent to the risk cup, depending on the population and age group. Ultimately, there is little additional cumulative risk by adding the simultaneous exposure of other phthalates to the single chemical risk estimates for DIBP using Approach 2 (*i.e.*, non-attributable cumulative exposure from NHANES adds 6.2–15.5% to the risk cup).

EPA has robust confidence in its CRA and moderate to robust confidence in its single chemical assessment of DIBP for workers (Section 4.3.2.1), consumers (Section 4.3.3.1), and the general population (Section 4.1.3.3). As discussed above in Section 4.4.3.1, EPA concluded that the strengths and uncertainties of both approaches to assess cumulative risk are well balanced. Both approaches are health-protective, science-based, and align with input from SACC. EPA selected Approach 2 to characterize cumulative risk for DIBP, simplifying the risk characterization as it is more consistent with the single chemical assessment.

5 ENVIRONMENTAL RISK ASSESSMENT:

DIBP – Environmental Risk Assessment (Section 5):
Key Points

EPA considered all reasonably available information identified through the systematic review process under TSCA to characterize environmental risk for DIBP. The following bullets summarize the key points.

- Aquatic species
  - RQs exceeding 1 were calculated for acute exposures to DIBP in aquatic species (vertebrates, invertebrates, and benthic invertebrates) from 4 OES.
  - RQs exceeding 1 were calculated for chronic invertebrate exposures to DIBP for 8 OES.
  - RQs exceeding 1 were calculated for algae exposures to DIBP for 12 OES.
  - RQs exceeding 1 were calculated for chronic vertebrate exposures to DIBP for 12 OES.
  - No RQs exceeded 1 for the sediment-dwelling assessment.
  - No RQs exceeded 1 for 3 OES under all flow scenarios: Manufacturing, Recyling, and Use of Laboratory Chemicals – Solid. EPA has slight to moderate confidence that risk is not indicated by these OES.
  - EPA has slight to moderate confidence in risk estimates for OES that indicate water release.
  - EPA has slight to slight to moderate confidence in risk estimates for OES with multimedia releases.
- Terrestrial species:
  - No RQs exceeding 1 were identified for exposures to DBP in terrestrial mammals through trophic transfer.
  - No RQs exceeding 1 were identified for exposures to DBP soil invertebrates from releases to soil.
  - No RQs exceeding 1 were identified for exposures to DBP in terrestrial plants from releases to soil.
- EPA has robust overall confidence in all other environmental risk assessment conclusions.

5.1 Summary of Environmental Exposures

EPA assessed environmental concentrations of DIBP in air, water, and land for use in environmental exposure. The environmental exposures are described in the *Draft Physical Chemistry and Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag) and the *Environmental Media and General Population and Environmental Exposure for* DIBP (U.S. EPA, 2025v). DIBP is expected to be released to the environment via air, water, biosolids, and landfills. It is expected to show strong affinity and sorption potential in organic carbon in soil and sediment and when released to air, DIBP is expected to adsorb to particulate matter, which will mostly partition to soil and water.

EPA conducted modeling with VVWM-PSC (U.S. EPA, 2019d) to estimate concentrations of DIBP within surface water and sediment. There are uncertainties in the relevance of limited monitoring data for biosolids and landfill leachate to the COUs considered for DIBP (U.S. EPA, 2025v). However, based on high-quality physical and chemical property data, EPA determined that DIBP will have low persistence potential in soils. Therefore, groundwater concentrations resulting from releases to the landfill or to agricultural lands via biosolids applications were not quantified but are discussed qualitatively. There are limited measured data on concentrations of DIBP in biosolids or soils receiving biosolids and uncertainty that concentrations used in this analysis are representative of all types of environmental releases. Based on the water solubility (6.2 mg/L) and hydrophobicity (log K_{OW} = 4.34; log K_{OC} = 2.67) of DIBP, it is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms. Therefore, DIBP has low potential for trophic transfer through food webs.

5.2 Summary of Environmental Hazards

EPA evaluated the reasonably available information for environmental hazard endpoints associated with DIBP exposure to ecological receptors in aquatic and terrestrial ecosystems. Due to limited environmental hazard data for DIBP, dibutyl phthalate (DBP) was used as an analog and a read-across was conducted to fill data gaps (U.S. EPA, 2025s). These hazards are described in the *Environmental Hazard Assessment for DIBP* (U.S. EPA, 2025t). For more information on the selection of an analog for DIBP, see Appendix A of the *Environmental Hazard Assessment for DIBP* (U.S. EPA, 2025t).

The acute aquatic concentration of concern (COC) for DIBP was derived from a species sensitivity distribution (SSD), which contained empirical 96-hour LC50s for 9 species identified in systematic review as well as an additional 72 species with predicted LC50 and EC50 values from the Web-based Interspecies Correlation Estimation (Web-ICE) (v4.0) toxicity value estimation tool (Raimondo et al., 2010). The SSD was developed using the SSD Toolbox (v1.1), which is an EPA resource that can fit SSDs to environmental hazard data (Etterson, 2020). Of the nine studies identified in systematic review and used in the SSD, two studies were from the DIBP empirical dataset and seven were from the DBP empirical dataset. The acute COC for aquatic vertebrates, invertebrates, and benthic invertebrates was 287 µg/L. All chronic aquatic COCs were calculated using read-across from DBP. The chronic aquatic vertebrate COC was 1.56 µg/L, the chronic aquatic invertebrate COC was 12.23 µg/L, the chronic aquatic benthic invertebrate COC was 114.3 mg/kg dry sediment, and the algae COC was 4.19 µg/L.

For terrestrial species, wildlife mammalian hazard data were not reasonably available; therefore, ecologically relevant reproductive endpoints from laboratory rodent studies were used to derive a hazard value for terrestrial mammals. Empirical DIBP toxicity data for rats were used to estimate a hazard value for terrestrial mammals at 353 mg/kg-bw/day. The terrestrial invertebrate hazard threshold for DIBP was 14 mg DBP/kg dry soil based on read-across from DBP while the terrestrial plant hazard threshold for DIBP was 10 mg DBP/kg dry soil based on a read-across from DBP (U.S. EPA, 2025s).

5.3 Environmental Risk Characterization

5.3.1 Risk Assessment Approach

The environmental risk characterization of DIBP was conducted to evaluate whether the potential releases and resultant exposures of DIBP in water, sediment, or soil will exceed the DIBP concentrations that result in hazardous effects to aquatic or terrestrial organisms. In evaluating the DIBP exposure concentrations, modeled DIBP concentrations in surface water were used to calculate risk quotients quantitatively. Additionally, modeled air deposition to soil was assessed quantitatively. Because land concentrations of DIBP in biosolids and landfills as well as in air are limited or not expected to be bioavailable, they were discussed qualitatively. In evaluating the environmental hazard of DIBP, a weight of evidence approach was used to select hazard threshold concentrations for the derivation of RQs for aquatic organisms. A weight of evidence approach was also used to select hazard threshold concentrations for a description of risk of DIBP for terrestrial organisms.

Environmental risk was characterized by calculating RQs (U.S. EPA, 1998; Barnthouse et al., 1982). The RQ is defined in Equation 5-1 as follows:

Equation 5-1. Calculating the Risk Quotient

$$RQ = \frac{Predicted\ Environmental\ Concentration}{Hazard\ Threshold}$$

For aquatic organisms, the "effect level" is a derived COC based on a hazard effects concentration. The COC used to calculate RQs for aquatic organisms was derived from hazard values resulting from acute and chronic exposures to DIBP (or analog DBP). An RQ equal to one indicates that the exposures are the same as the concentration that can cause effects. If the RQ is above one, the exposure is greater than the effect concentration and risk is indicated. If the RQ is below one, the exposure is less than the effect concentration and risk is not indicated.

Environmental monitoring and biomonitoring data were reviewed and screened to assess wildlife exposure to DIBP (U.S. EPA, 2025v). EPA conducted a trophic transfer assessment by evaluating the chemical and physical properties, fate, and exposure of DIBP and determined that DIBP does not bioaccumulate. Due to its physical and chemical properties, environmental fate, and exposure parameters, DIBP is not expected to persist in surface water, groundwater, or air. Additionally, because DIBP has low bioaccumulation and biomagnification potential in aquatic and terrestrial organisms, it is expected to go through trophic dilution as it passes through food webs.

5.3.2 Risk Characterization for Aquatic Receptors

Releases of DIBP to water with subsequent exposure in surface water and sediments were identified for 15 OESs (Table 3-6). Risk to aquatic organisms was characterized by comparing hazard thresholds (COCs) to modeled surface water exposures from water releases. Risk to aquatic benthic organisms was characterized by comparing COCs to modeled benthic sediment concentrations resulting from water releases. For the purposes of risk screening, the upper-bound surface water concentration was the DIBP limit of water solubility (6.2 mg/L) (U.S. EPA, 2025ag). Surface water concentrations from high-end and central tendency releases for P50 7Q10 flows, P75 7Q10 flows, and P90 7Q10 flows were modeled and used to derive RQ values.

For each of the 15 OES, EPA conducted modeling with VVWM-PSC (U.S. EPA, 2019d) to estimate concentrations of DIBP within surface water and sediment. The 7Q10 P50 flow distribution includes the maximum modeled surface water concentrations, which likely overestimates modeled concentrations. EPA considers flows from the upper percentiles of the generic distribution (*i.e.*, P75 or P90) to be more appropriately paired with the high-end release estimates (U.S. EPA, 2025v). Eight of the total 15 OES indicated water releases as a possible type of discharge (Table 3-6). Four of these eight OES indicated release as either wastewater to on-site treatment or discharge to POTW. For these OES, RQs were calculated applying a 68 percent wastewater removal treatment efficiency (U.S. EPA, 1982).The other four of these 8 OESs had information that indicated the type of discharge as either wastewater to on-site treatment or discharge to POTW or possibly direct to surface water; therefore, RQs for these OESs were also calculated without wastewater removal treatment applied. Whether the surface water concentration is based on wastewater treatment or direct release is an assumption of two possible scenarios within the modeled values, without direct evidence of one being more likely than the other. Therefore, for those four OES, for which the type of discharge indicated either on-site treatment or discharge to POTW or direct to surface water, RQs were calculated for both scenarios.

Modeled Generic Scenario OES with Multimedia Releases

For the remaining 7 of 15 total OESs, the modeled generic scenarios did not distinguish the amount or type of discharge (*i.e.*, landfill, incineration, surface water, or combination).

- Use of laboratory chemicals – solids
- Use of laboratory chemicals – liquids
- Use as a catalyst – formulation into pre-catalyst
- Application of paints and coatings
- Repackaging into large and small containers
- Application of adhesives and sealants
- Use as a catalyst – intermediate in polypropylene manufacturing

For these seven OESs, there was insufficient information to determine the fraction of the release going to each of the reported media types, including to surface water. Thus, RQs were first calculated with the conservative assumption of 100 percent release to surface water without wastewater treatment, which represents a reasonable upper bound for exposure. Due to uncertainty in receiving water body flow rates and the wide range of potential RQs depending on the combination of release and flow rate chosen, EPA has slight confidence in the resulting risk quotients for generic releases where at least one assessed combination of releases and water flows resulted in an RQ greater than 1 given wastewater treatment and multimedia exposure refinements. Thus, if the range of potential RQs, accounting for wastewater treatment, percent release to surface water, and flow rate, for a generic scenario encompasses the benchmark of 1, EPA is only slightly confident in its characterization of whether potential environmental risk can occur. Conversely EPA has more confidence in the overall risk characterization for generic releases where no assessed combination of releases and water flows resulted in an RQ greater than 1, because at the highest assessed potential combination for generic scenarios (the high-end/P50 scenario), EPA believes there is considerable conservatism in the estimated water concentration. All COUs and a description of whether RQs exceed one can be found in Table 5-1. Further description of all COUs where RQs exceeded one can be found in Table 5-2. All days of exceedance were greater than the hazard threshold study duration for the release scenarios.

One of these OES (Use of laboratory chemicals – solids) had increased confidence due to no RQ > 1 with conservative assumptions. One of these OES (Use as a catalyst – formulation into pre-catalyst) had industry submitted data to ground truth the surface water concentrations, which increased confidence in the risk estimates. For the remaining five OES, risk estimates spanned the benchmark (RQ = 1), and no additional data were available to refine the analysis. Therefore, a sensitivity analysis was conducted to determine the impact on RQs from the specific inputs of the level of releases to surface water and the percent wastewater treatment removal. For this sensitivity analysis, RQs were calculated using 100, 75, 50, 25, 5, 1, and 0.01 percent releases to surface water. RQs were also evaluated with wastewater treatment removal rates of 0 percent (no wastewater treatment), 68 percent, and 90 percent (near the upper range of wastewater treatment removal of 65–95% described in Table 2-2). Surface water concentrations were calculated by applying the 50th, 75th, and 90th percentile (P50, P75 and P90, respectively) flow metrics from the distribution to represent a more complete range of potential flow rates. A summary of risk estimates using central tendency exposure and a wastewater treatment removal of 68 percent and a P75 flow rate is below, as these are generally expected to be the most representative. Risk estimates across the full range of these variables are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP (*U.S. EPA, 2025ah*).*

Two of the OES with multimedia releases (Use of laboratory chemicals – solid and Use of laboratory chemicals – liquid) map to a single COU (Commercial Use – Laboratory chemicals – Laboratory chemicals). The multimedia release OES Use of laboratory chemicals – solids did not have any RQ > 1 even with conservative assumptions of P50 flow rates, 100 percent release to surface water, and no wastewater treatment. Therefore, EPA has slight to moderate confidence in risk estimate for this OES.

For the Use of laboratory chemicals – liquid OES, RQ for central tendency chronic exposure to aquatic vertebrates was 3.75 when assuming 100 percent of the release was apportioned to surface water, wastewater treatment removal of 68 percent, and using a P75 flow rate. This decreased to an RQ of 1.88 when assuming a 25 percent release to surface water, and the RQ fell below the benchmark to 0.94 at 25 percent release to surface water for this scenario. When the assumption of wastewater treatment removal was increased to 90 percent, which is expected to be the upper bound of removal, the RQ remained above the benchmark at 1.17 with 100 percent of release apportioned to surface water and dropped below the benchmark to 0.88 at 75 percent release to surface water for the same scenario. This sensitivity analysis shows that percent discharge to surface water and wastewater removal percentage are sensitive parameter for risk estimates for this OES. Given the uncertainty in these parameters and that the RQ crosses the benchmark across a variety of reasonable scenarios in this sensitivity analysis, there is still slight confidence in the overall risk of the OES Laboratory chemicals – liquid. Risk estimates across the full range of these variables are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP (*U.S. EPA, 2025ah*)*.

The multimedia release OES Use as a catalyst – formulation into pre-catalyst maps to the COU Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production). There was existing facility release data available through confidential business information that supports the modeled P90 high-end release, with no wastewater treatment, surface water value as reflective of reasonable actual release for the Use as a catalyst – formulation into pre-catalyst OES. This scenario resulted in an RQ of 2.97 for chronic exposure to aquatic vertebrates. Therefore, EPA has slight to moderate confidence in this risk estimates for this OES.

The Application of paints and coatings OES maps to two COUs: Industrial Use – application of paints and coatings and Commercial Use – application of paints and coatings. The RQ for central tendency chronic exposure to aquatic vertebrates for the Application of paints and coatings OES was 24.4 when assuming 100 percent of the release was apportioned to surface water, wastewater treatment removal of 68 percent, and using a P75 flow rate. However, this decreased to an RQ of 1.22 when assuming a 5 percent release to surface water, and the RQ fell below the benchmark to 0.91 at 1 percent release to surface water for this P75 flow rate scenario. When the assumption of wastewater treatment removal was increased to 90 percent , which is expected to be closer to the upper bound of removal based on the range of wastewater treatment removal of 65-95 percent in Table 2-2, the RQ remained above the benchmark at 7.63 with 100 percent of release apportioned to surface water but dropped below the benchmark to 0.76 at 10 percent release to surface water for the same scenario. Even though EPA has slight confidence in the release estimates for OES with multimedia releases, , this sensitivity analysis increases confidence from slight to slight to moderate that this OES results in RQ > 1. Risk estimates across the full range of these variables are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP (*U.S. EPA, 2025ah*)*.

The Repackaging into large and small containers OES maps to two COUs: Manufacturing – import and Processing – repackaging (*e.g.*, laboratory chemicals). The RQ for central tendency chronic exposure to aquatic vertebrates for the Repackaging into large and small containers OES was 1.64 when assuming 100 percent of the release was apportioned to surface water, wastewater treatment removal of 68 percent, and using a P75 flow rate. This decreased to an RQ of 1.23 when assuming a 75 percent release to surface water, and the RQ fell below the benchmark to 0.82 at 50 percent release to surface water for this scenario of central tendency exposure with 68 percent wastewater treatment removal (moderate assumptions). When the assumption of wastewater treatment removal was increased to 90 percent, which is expected to be the upper bound of removal, the RQ fell below the benchmark at 0.51 with 100 percent of release apportioned to surface water for the same scenario. This sensitivity analysis shows that percent discharge to surface water is a sensitive parameter for risk estimates for this OES. Given the uncertainty in this parameter and that the RQ crosses the benchmark across a variety of reasonable scenarios in this sensitivity analysis, there is still slight confidence in the overall risk of this OES. Risk estimates across the full range of these variables are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP (*U.S. EPA, 2025ah*).*

The application of adhesives and sealants OES maps to two COUs (Industrial Use – application of adhesives and sealants – Adhesives and sealants: two-component glues and adhesives; transportation equipment manufacturing and Commercial Use – application of adhesives and sealants – Adhesives and sealants: two-component glues and adhesives; transportation). The Use as a catalyst – intermediate in polypropylene manufacturing OES maps to the Processing – use as a reactant – intermediate in plastic manufacturing COU. The RQs were below the benchmark for central tendency chronic exposure to aquatic vertebrates when assuming 100 percent of the release was apportioned to surface water, wastewater treatment removal of 68 percent, and using a P75 flow rate for these remaining two OES with multimedia releases: Application of adhesives and sealants (RQ = 0.63) and Use as a catalyst – intermediate in polypropylene manufacturing (RQ = 0.61). These OES had RQs of 1.97 and 1.89, respectively, for the same scenario without wastewater treatment. This sensitivity analysis shows that percent discharge to surface water is a sensitive parameter for risk estimates for these OES. Given the uncertainty in this parameter and that the RQ crosses the benchmark across a variety of reasonable scenarios in this sensitivity analysis, there is still slight confidence in the overall risk of these OES. Risk estimates across the full range of these variables are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP (*U.S. EPA, 2025ah*).*

Table 5-1. Environmental Risk Summary and Basis for Risk Characterization

Life Cycle Stage – Category	Subcategory	OES	RQs >1	Overall Confidence in Resulting RQs
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Adhesive manufacturing, Plastic product manufacturing	Plastic compounding	Yes	Slight to Moderate
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings			
	Processing aids, not otherwise listed			
Processing – Incorporation into article	Plasticizers in: –Plastic product manufacturing; transportation equipment manufacturing	Plastic converting	Yes	Slight to Moderate
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – Adhesive manufacturing, Plastic product manufacturing	Incorporation into adhesives and sealants	Yes	Slight to Moderate
Processing – Processing – incorporation into	Solvents (which become part of product formulations or mixture) – Plastic material and resin manufacturing; Paints and coatings	Incorporation into paints and coatings	Yes	Slight to Moderate

Life Cycle Stage – Category	Subcategory	OES	RQs >1	Overall Confidence in Resulting RQs
formulation, mixture, or reaction product				
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere Foam pipeline pig manufacturing	Rubber manufacturing – compounding	Yes	Slight to Moderate
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere Foam pipeline pig manufacturing	Rubber manufacturing – converting	Yes	Slight to Moderate
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	No	Slight to Moderate
Processing – Recycling	Recycling	Recycling	No	Slight to Moderate
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst	Yes	Slight to Moderate
Manufacturing – Importing	Importing	Repackaging into large and small containers	Yes	Slight[a]
Processing – Repackaging	Repackaging (*e.g.*, laboratory chemicals)			
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing	Yes	Slight[a]
Industrial Use – Adhesives and sealants	Adhesives and sealants –two-component glues and adhesives – Transportation equipment manufacturing	Application of adhesives and sealants	Yes	Slight[a]
Commercial Use – Adhesives and sealants	Adhesives and sealants –two-component glues and adhesives			
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings	Yes	Slight to Moderate
Commercial Use – Paints and coatings	Paints and coatings			
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals – solids	No	Slight to Moderate
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory	Yes	Slight[a]

Life Cycle Stage – Category	Subcategory	OES	RQs >1	Overall Confidence in Resulting RQs
		chemicals – liquids		

[a] RQs were calculated with the conservative assumption of 100 percent release to surface water without wastewater treatment, which represents a reasonable upper bound for exposure. Due to uncertainty in receiving water body flow rates and the wide range of potential RQs depending on the combination of release and flow rate chosen, EPA has slight confidence in the resulting risk quotients for generic releases where plausible combinations of releases and water flows assessed in the sensitivity analysis resulted in RQs spanning the benchmark (RQ = 1).

Acute Exposure to Aquatic Organisms

The COC for acute exposure to aquatic organisms, including aquatic and benthic vertebrates and invertebrates, was derived from a species sensitivity distribution containing empirical and modeled hazard data (U.S. EPA, 2025t), which was 287 µg/L DIBP. This acute COC for mortality is based on 96 hours of exposure. For acute exposures, RQs exceeded one for a single OES that specified water release, which was Plastic Compounding (Table 5-3). An RQ of 1.41 was calculated for Plastic Compounding high-end, P50 flow scenario without wastewater treatment (Table 5-3). With wastewater treatment (68%) there were no RQs exceeding one for this OES. For the Plastic Compounding OES, wastewater treatment or direct release is an assumption of two possible scenarios within the modelled values, without direct evidence of one being more likely than the other. Of the multimedia release OESs, three had RQs exceeding one (assuming 100% release to surface water in the absence of information to determine the fraction of the release going to each of the reported media types and no assumption related to removal from wastewater treatment). EPA has an overall slight confidence in these releases from multimedia OES as there was insufficient information to determine the fraction of the release going to each of the reported media types, including to surface water. The use of 100 percent release to surface water and no removal from wastewater treatment represents a reasonable upper bound of exposure, but as the risk estimates span the benchmark when these parameters are varied, EPA cannot provide additional confidence in these OES.

Chronic Exposure to Aquatic Benthic Invertebrates

The COC for chronic exposures to aquatic benthic invertebrates was determined from a read-across from DBP in which a COC of 114.3 mg/kg dry sediment was derived from a 10-day study on the midge (U.S. EPA, 2025t). Under all 7Q10 modeled benthic sediment concentrations for all OESs there were no RQs exceeding one for exposures to benthic invertebrates. Thus, under all scenarios, chronic exposure of DIBP to benthic invertebrates did not indicate risk.

Chronic Exposure to Aquatic Invertebrates

The COC for chronic exposures to aquatic invertebrates was determined by read across from DBP in which a COC of 12.23 µg/L was derived from a 14-day study on the amphipod crustacean (U.S. EPA, 2025t). Of the eight OES that specify water release, four had RQs exceeding one for chronic exposures to aquatic invertebrates: Plastic Compounding, Plastic Converting, Incorporation into Paints and Coatings, Incorporation into Adhesives and Sealants. Two of these four indicated possible direct release to surface water, Plastic Compounding and Plastic Converting. For Plastic Compounding direct release to surface water, RQs exceeded one at the high-end and central tendency P50 and P75 flow. For Plastic Compounding direct release to surface water, RQs exceeded one at the high-end P50 and P75 flows. With wastewater treatment (68%), three of these four OES (Plastic Compounding, Incorporation into Paints and Coatings, Incorporation into Adhesives and Sealants) had RQs exceeding one at high-end and central tendency P50 flow. With wastewater treatment (68%), Plastic Compounding also had an RQ of 2.36 for high-end P75 flow.

Of the seven multimedia release OESs, four had RQs exceeding one (assuming 100% release to surface water in the absence of information to determine the fraction of the release going to each of the reported media types and no assumption related to removal from wastewater treatment). Application of Paints and Coatings, Repackaging into Large and Small Containers, Use of Laboratory Chemicals – Liquid, and Use as a Catalyst – Formulation into Pre-Catalyst all had RQs exceeding one at high-end P50 flow and P75 flow as well as central tendency P50 flow. Further, Application of Paints and Coatings and Use of Laboratory Chemicals – Liquid had RQs exceeding one at central tendency P75 flow and Application of Paints and Coatings at high-end P90 flow. EPA has slight confidence in these RQs calculated from seven multimedia OES where risk is identified across a variety of release assumptions, including those that represent an upper bound (*e.g.*, 100 percent release to surface water) present risk. For the Use as a catalyst – formulation into pre-catalyst OES, existing facility release data through confidential business information supports the modeled P90 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release. No RQs exceeded one at P90 flow for chronic aquatic invertebrates.

Exposure to Aquatic Algae

The COC for exposures to aquatic algae was determined by read-across from DBP in which a COC of 4.19 μg/L was derived from a 48-hour study on green algae (U.S. EPA, 2025t). Of the eight OES that specify water release, four had RQs exceeding one for exposures to aquatic algae: Plastic Compounding, Plastic Converting, Incorporation into Paints and Coatings, Incorporation into Adhesives and Sealants (Table 5-3). For two of these four which indicate possible direct release to surface water, Plastic Compounding and Plastic Converting, all RQs exceeded one at the P50 and P75 flow. Additionally for Plastic Converting, an RQ of 1.66 was calculated for high-end P90 flow. With wastewater treatment, these four OES all had RQs exceeding one at high-end and central tendency P50 flow, except for Plastic Converting central tendency, which did not have an RQ exceeded one at the central tendency P50 flow. Further, Plastic Compounding had RQs exceeded one at high-end (6.88) and central tendency (1.40) P75 flow and Plastic Converting and Incorporation into Paints and Coatings had RQs exceeded one at high-end P75 flow (1.60 and 2.13, respectively).

Six of the seven multimedia release OESs had RQs exceeding one (assuming 100% release to surface water in the absence of information to determine the fraction of the release going to each of the reported media types and no assumption related to removal from wastewater treatment). The multimedia OES Application of Paints and Coatings had RQs exceeding one at all flow scenarios. Repackaging into Large and Small Containers, Use of Laboratory Chemicals – Liquid, and Use as a Catalyst – Formulation into Pre-Catalyst all had RQs exceeding one at high-end and central tendency P50 and P75 flow. The multimedia OES Application of Adhesives and Sealants and Use as a Catalyst– intermediate in polypropylene manufacturing had RQs exceeding one at high-end P50 flow. Additionally, Use as a Catalyst– intermediate in polypropylene manufacturing had RQs exceeding one at central tendency P50 flow. EPA has slight confidence in these RQs calculated from these multimedia OES, except for Use as a Catalyst – Formulation into Pre-Catalyst, which has slight to moderate confidence because existing facility release data through confidential business information supports the modeled P90 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release. An RQ exceeding one (1.11) was calculated for Use as a Catalyst – Formulation into Pre-Catalyst at high-end P90 flow.

Chronic Exposure to Aquatic Vertebrates

The COC for chronic exposures to aquatic vertebrates was determined by read across from DBP in which a COC of 1.56 μg/L was derived from a 112-day study on the Japanese Medaka (U.S. EPA, 2025t). Of the eight OES that specify water release, six had RQs exceeded one for exposures to aquatic vertebrates: Plastic Compounding, Plastic Converting, Incorporation into Paints and Coatings, Incorporation into Adhesives and Sealants, Rubber manufacturing – compounding, and Rubber manufacturing – converting (Table 5-3). For four of these six, Plastic Compounding, Plastic Converting, Rubber manufacturing – compounding, and Rubber manufacturing – converting all RQs exceeded one at the P50 and P75 flow. Additionally for Plastic Converting, RQs of 4.46 and 1.032 were calculated for high-end and central tendency P90 flow, respectively. With wastewater treatment, four OES had RQs exceeding one: Plastic Compounding, Plastic Converting, Incorporation into Paints and Coatings, Incorporation into Adhesives and Sealants. All of these had RQs exceeded one at high-end and central tendency P50 and P75 flow, except for Incorporation into Adhesives and Sealants, which did not have an RQ exceeded one at the central tendency P75 flow. Conversely, Plastic Converting had an RQ of 1.43 at high-end P90 flow.

Six of the seven multimedia release OESs had RQs exceeding one (assuming 100% release to surface water in the absence of information to determine the fraction of the release going to each of the reported media types and no assumption related to removal from wastewater treatment). The multimedia OES Application of Paints and Coatings, Repackaging into Large and Small Containers, Use of Laboratory Chemicals – Liquid, and Use as a Catalyst – Formulation into Pre-Catalyst had RQs exceeding one at all flow scenarios. Application of Adhesives and Sealants and Use as a Catalyst– intermediate in polypropylene manufacturing, had RQs exceeding one at high-end and central tendency P50 and P75 flow. EPA has slight confidence in these RQs calculated from these multimedia OES, except for Use as a Catalyst – Formulation into Pre-Catalyst, which has slight to moderate confidence because existing facility release data through confidential business information supports the modeled P90 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release. An RQ exceeding one (2.97) was calculated for Use as a Catalyst – Formulation into Pre-Catalyst at high-end P90 flow.

Table 5-2. DIBP COU/OES Risk Quotients (RQ) >1 for Aquatic Species Exposed to Modeled DIBP in Water

COU: Life Cycle Stage – Category	COU: Subcategory	OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]: Acute	Risk Quotient (RQ)[c]: Chronic Invertebrate	Risk Quotient (RQ)[c]: Algae	Risk Quotient (RQ)[c]: Chronic Vertebrate
Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Central tendency	P50	0	82.2	0.29	**6.72**	**19.6**	**52.7**
					68	26.3	0.09	**2.15**	**6.28**	**16.9**
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings			P75	0	18.3	0.06	**1.49**	**4.37**	**11.73**
					68	5.86	0.02	0.48	**1.40**	**3.75**
				P90	0	0.29	0.00	0.02	0.07	0.19
					68	0.09	0.00	0.01	0.02	0.06
			High-end	P50	0	405	**1.41**	**33.1**	**96.7**	**260**
					68	130	0.45	**10.6**	**30.9**	**83.1**
	Processing aids, not otherwise listed			P75	0	90.2	0.31	**7.38**	**21.5**	**57.8**
					68	28.9	0.10	**2.36**	**6.89**	**18.5**
				P90	0	1.43	0.00	0.12	0.34	0.92
					68	0.46	0.00	0.04	0.11	0.29
Processing – incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastic converting	Central tendency	P50	0	7.73	0.03	0.63	1.84	**4.96**
					68	2.47	0.01	0.20	0.59	**1.59**
				P75	0	6.43	0.02	0.53	**1.53**	**4.12**
					68	2.06	0.01	0.17	0.49	**1.32**
				P90	0	1.61	0.01	0.13	0.38	**1.03**
					68	0.52	0.00	0.04	0.12	0.33
			High-end	P50	0	33.50	0.12	**2.74**	**8.00**	**21.47**
					68	10.7	0.04	0.88	**2.56**	**6.87**
				P75	0	27.90	0.10	**2.28**	**6.66**	**17.9**
					68	8.93	0.03	0.73	**2.13**	**5.72**
				P90	0	6.96	0.02	0.57	**1.66**	**4.46**
					68	2.23	0.01	0.18	0.53	**1.43**

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	Subcategory						Acute	Chronic Invertebrate	Algae	Chronic Vertebrate
Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Central tendency	P50	68	13.6	0.05	**1.11**	**3.24**	**8.70**
				P75	68	1.23	0.00	0.10	0.29	0.79
				P90	68	0.32	0.00	0.03	0.08	0.21
			High-end [d]	P50	68	13.7	0.05	**1.12**	**3.28**	**8.80**
				P75	68	1.24	0.00	0.10	0.30	0.80
				P90	68	0.33	0.00	0.03	0.08	0.21
Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Central tendency	P50	68	12.6	0.04	**1.03**	**3.01**	**8.08**
				P75	68	3.36	0.01	0.27	0.80	**2.15**
				P90	68	0.07	0.00	0.01	0.02	0.05
			High-end	P50	68	25	0.09	**2.05**	**5.97**	**16.04**
				P75	68	6.69	0.02	0.55	**1.60**	**4.29**
				P90	68	0.15	0.00	0.01	0.04	0.09
Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – compounding	Central tendency	P50	0	2.03	0.01	0.17	0.48	**1.30**
					68	0.65	0.00	0.05	0.16	0.42
				P75	0	1.60	0.01	0.13	0.38	**1.03**
					68	0.51	0.00	0.04	0.12	0.33
				P90	0	0.30	0.00	0.02	0.07	0.19
					68	0.10	0.00	0.01	0.02	0.06
			High-end	P50	0	2.71	0.01	0.22	0.65	**1.74**
					68	0.87	0.00	0.07	0.21	0.56
				P75	0	2.13	0.01	0.17	0.51	**1.37**
					68	0.68	0.00	0.06	0.16	0.44
				P90	0	0.40	0.00	0.03	0.10	0.26
					68	0.13	0.00	0.01	0.03	0.08

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	**Subcategory**						**Acute**	**Chronic Invertebrate**	**Algae**	**Chronic Vertebrate**
Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – converting	Central tendency	P50	0	2.17	0.01	0.96	0.52	**1.39**
					68	0.69	0.00	0.06	0.17	0.45
				P75	0	1.71	0.01	0.14	0.41	**1.10**
					68	0.55	0.00	0.04	0.13	0.35
				P90	0	0.32	0.00	0.03	0.08	0.21
					68	0.10	0.00	0.01	0.02	0.07
			High-end	P50	0	2.93	0.01	0.24	0.70	**1.88**
					68	0.94	0.00	0.08	0.22	0.60
				P75	0	2.31	0.01	0.19	0.55	**1.48**
					68	0.74	0.00	0.06	0.18	0.47
				P90	0	0.43	0.00	0.04	0.10	0.28
					68	0.14	0.00	0.01	0.03	0.09

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario (basis of release estimate); SWC = surface water concentration; RQ = risk quotient; WWT = wastewater treatment

Bolded and shaded values indicate RQ> 1.

[a] Central tendency and high-end represent the median and 95th percentile of environmental release, respectively.

[b] Percentage of DIBP removed with wastewater treatment (WWT) was determined from (U.S. EPA, 1982). Zero value indicates no WWT, or direct to surface water, which was only applied to the COUs in which direct to surface water was indicated as a potential media of release (Table 3-6).

[c] Concentrations of concern (COC) are 1.56 µg/L for chronic vertebrate, 12.26 µg/L for chronic invertebrate, and 4.19 µg/L for algae.

[d] Single RQ> 1 for acute (COC of 287 µg/L) high-end P50 flow.

Table 5-3. DIBP COU/OES Risk Quotients (RQ) >1 for Aquatic Species Exposed to Modelled DIBP with Multimedia Releases

COU		OES	Surface Water Release[a]	Flow	WWT (%)[b]	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	**Subcategory**						**Acute**	**Chronic Invertebrates**	**Algae**	**Chronic Vertebrates**
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings	Central tendency	P50	0	861	**3.00**	**70.4**	**205**	**552**
				P75	0	119	**0.41**	**9.73**	**28.4**	**76.3**
				P90	0	4.50	0.02	0.37	**1.07**	**2.88**
			High-end	P50	0	2480	**8.64**	**203**	**591.89**	**1590**
				P75	0	342	**1.19**	**27.9**	**81.6**	**219**
				P90	0	13.0	0.05	**1.06**	**3.10**	**8.33**
Processing – Repackaging	Repackaging	Repackaging Into Small and Large Containers	Central tendency	P50	0	411	**1.43**	**33.6**	**98.1**	**263**
				P75	0	7.98	0.03	0.65	**1.90**	**5.12**
				P90	0	0.65	0.00	0.05	0.16	**0.42**
			High-end	P50	0	1040	**3.62**	**85.0**	**248**	**667**
				P75	0	20.1	0.07	**1.64**	**4.80**	**12.9**
				P90	0	1.66	0.01	0.14	0.40	**1.06**
Commercial Use – Other uses	Laboratory chemicals	Use of Laboratory Chemicals – Liquid	Central tendency	P50	0	491	**1.71**	**40.2**	**117**	**315**
				P75	0	18.3	0.06	**1.50**	**4.37**	**11.7**
				P90	0	1.94	0.01	0.16	0.46	**1.24**
			High-end	P50	0	932	**3.25**	**76.21**	**222**	**597**
				P75	0	34.8	0.12	**2.85**	**8.31**	**22.3**
				P90	0	3.68	0.01	0.30	0.88	**2.36**
Processing – incorporation into formulation, mixture, or reaction product[e]	Use as a catalyst	Use as a catalyst – formulation into pre-catalyst	Central tendency	P50	0	40.6	0.14	**3.32**	**9.69**	**26.0**
				P75	0	27.1	0.09	**2.22**	**6.47**	**17.4**
				P90	0	1.74	0.01	0.14	0.42	**1.12**
			High-end	P50	0	108	0.38	**8.83**	**25.8**	**69.2**
				P75	0	72.1	0.25	**1.50**	**17.2**	**46.2**
				P90[e]	0	4.63	0.02	0.02	**1.11**	**2.97**
Industrial and Commercial Use – Adhesives and sealants	Equipment manufacturing	Application of adhesives and sealants	Central tendency	P50	0	3.84	0.01	0.31	0.92	**2.46**
				P75	0	3.07	0.01	0.25	0.73	**1.97**
				P90	0	0.65	0.00	0.05	0.15	0.41
			High-end	P50	0	10.6	0.04	0.87	**2.53**	**6.79**
				P75	0	8.48	0.03	0.69	**2.02**	**5.44**
				P90	0	1.79	0.01	0.15	0.43	**1.15**

COU		OES	Surface Water Release[a]	Flow	WWT (%)[b]	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	Subcategory						Acute	Chronic Invertebrates	Algae	Chronic Vertebrates
Processing – As a reactant	Plastic manufacturing	Intermediate in polypropylene manufacturing	Central tendency	P50	0	4.41	0.02	0.36	**1.05**	2.83
				P75	0	2.95	0.01	0.24	0.70	**1.89**
				P90	0	0.19	0.00	0.02	0.05	0.12
			High-end	P50	0	8.28	0.03	0.68	**1.98**	**5.31**
				P75	0	5.53	0.02	0.45	**1.32**	**3.54**
				P90	0	0.36	0.00	0.03	0.08	0.23

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario (basis of release estimate); SWC = surface water concentration; RQ = risk quotient; WWT = wastewater treatment.
The media of release can be found in Table 3-6
Bolded and shaded values indicate RQ> 1.
[a] Central tendency and high-end represent the median and 95th percentile of environmental release, respectively.
[b] Percentage of DIBP removed with wastewater treatment (WWT) was determined from (U.S. EPA, 1982). Zero value indicates no WWT, or direct to surface water, which was only applied to the COUs in which direct to surface water was indicated as a potential media of release (Table 3-6).
[c] Concentrations of concern (COC) are 1.56 µg/L for chronic vertebrate, 12.26 µg/L for chronic invertebrate, and 4.19 µg/L for algae.
[d] Two RQ> 1 for acute (COC of 287 µg/L) high-end and Central Tendency P50 flow.
[e] For this COU, existing facility release data (through confidential business information) supports the modeled P90 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release.

5.3.3 Risk Characterization for Terrestrial Receptors

EPA calculated an RQ for terrestrial organisms based on modeled DIBP soil concentrations via air deposition to soil near facilities that release DIBP. The Agency relied on the IIOAC modeled concentrations and deposition rates to characterize ecological exposure. DIBP releases were estimated and used as a direct input to the IIOAC Model (U.S. EPA, 2025w). Environmental RQs for terrestrial organisms associated with air deposition to soil can be found in Table 5-4. DIBP releases were estimated and used as a direct input to the IIOAC Model (U.S. EPA, 2025w).

Table 5-4. Environmental Risk Quotients (RQs) for Terrestrial Organisms Associated with Air Deposition to Soil Releases of DIBP

OES	Soil Concentration	Organism	Exposure Duration (days)	Hazard Value	RQ
All	0.000003530 mg/kg (365-day release)	Springtail (*Folsomia fimetaria*); soil invertebrate	21	14 mg/kg	2.56 E−07
		Bread wheat (*Triticum aestivum*); terrestrial plant	40	10 mg/kg	3.59 E−07

Air Deposition to Soil

Modeling results indicate a rapid decline in DIBP concentrations from air deposition to soil. The annual average deposition rates from fugitive and stack releases of DIBP to soil at 100 m was 0.193 and 0.0259 mg/m^2, respectively, for a total annual deposition rate of 0.219 mg/m^2. This annual deposition rate corresponds to an annual contribution to average soil concentration of 3.530×10^{-6} mg/kg/yr. Because DIBP has low bioaccumulation potential and experiences biodilution across trophic levels (U.S. EPA, 2025ag), its transfer through food webs is expected to experience trophic dilution and will be less than the amount deposited to soil. For soil invertebrates and terrestrial plants, the hazard values are seven orders of magnitude higher than the estimated soil concentration, with RQ values of 2.56×10^{-7} and 3.59×10^{-7}, respectively (Table 5-4). Therefore, COU/OES based fugitive and stack air releases of DIBP and subsequent deposition to soil are not expected to produce environmental concentrations leading to hazardous effects within soil invertebrates or terrestrial plants. EPA did not identify risk to terrestrial invertebrates or plants due to low soil exposure concentrations relative to hazard values in soil.

Landfill

No studies have directly evaluated the presence of DIBP in landfill or waste leachate. Due to its high affinity for organic carbon and organic media (log K_{OC} = 2.67, log K_{OW} = 4.34), DIBP is expected to be present at low concentrations in landfill leachate (U.S. EPA, 2025v). Further, no studies were identified that reported the concentration of DIBP in landfills or in the surrounding areas. DIBP that might be present in landfill leachates is not expected to be mobile in receiving soils and sediments due to its high affinity for organic carbon.

There is limited information regarding DIBP in dewatered biosolids, which may be sent to landfills for disposal. DIBP has been identified in wastewater sludge in the United States and Canada (Ikonomou et al., 2012), as well as at various facilities across China (Zhu et al., 2019; Meng et al., 2014). A 2012 survey of North American wastewater plants identified DIBP in sludge at concentrations ranging from 0.1 to 76.7 ng/g dry weight (Ikonomou et al., 2012). These reported concentrations were well below hazard values for benthic organisms (114.3 mg/kg; 1 ng/g is equivalent to 0.001 mg/kg) and below concentrations that might be expected to transfer up the food web via trophic transfer and potentially affect terrestrial organisms. DIBP is not likely to be persistent in groundwater/subsurface environments unless anoxic conditions exist. As a result, the qualitative evidence indicates that DIBP migration from landfills to surface water and sediment is limited and not likely to pose risk to aquatic and terrestrial organisms.

Disposal

Environmental releases can occur from consumer products and articles containing DIBP via their end-of-life disposal and demolition in the built environment or landfills, as well as from associated down-the-drain releases of DIBP. It is difficult for EPA to quantify these end-of-life and down-the-drain exposures due to limited reasonably available information on source attribution of the consumer COUs. Although the Agency acknowledges that there may be DIBP releases to the environment via the cleaning and disposal of adhesives, sealants, paints, coatings, and cleaning and furnishing care products, EPA did not quantitatively assess these products (Section 3.1.3). The Agency expects that environmental releases of DIBP from consumer disposal will be negligible and not expected to exceed hazard to ecological receptors and therefore arrived at an indication of no risk.

Biosolids

DIBP has been identified in several U.S.-based and international surveys of wastewater sludge, composted, and stabilized biosolids. As noted above, a 2012 survey of North American wastewater plants identified DIBP in sludge at concentrations ranging from 0.1 to 76.7 ng/g dry weight (Ikonomou et al., 2012). There are currently no U.S.-based studies reporting DIBP concentration in soil after land application. DIBP containing sludge and biosolids have not been reported for uses in surface land disposal or agricultural application.

No anaerobic or aerobic degradation studies were identified for DIBP. However, similar phthalates including its primary isomer, dibutyl phthalate (DBP), reported half-lives in soil ranging from hours to several hundred days (Net et al., 2015). Based on the solubility (6.2 mg/L) and hydrophobicity (log K_{OC} = 2.67, log K_{OW} = 4.34), DIBP is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms.

Concentrations of DIBP in soil following agricultural application of municipal biosolids were not identified from the Toxics Release Inventory (TRI) or National Emissions Inventory (NEI) release data nor were any monitoring studies identified during systematic review. As such, DIBP concentrations in soil were estimated using the concentrations identified in sludge concentrations ranging from 0.1 to 76.7 ng/g dry weight (Ikonomou et al., 2012). See Table 3-2 in the *Environmental Media and General Population Exposure for DIBP* (U.S. EPA, 2025v). This is several orders of magnitude below the hazard values for benthic organisms (114.3 mg/kg), soil organisms (14 mg/kg) or terrestrial plants (10 mg/kg). These comparisons support the conclusion that potential DBP concentrations in biosolids do not present risk to environmental organisms.

Distribution in Commerce

EPA evaluated activities resulting in exposures associated with distribution in commerce throughout the various life cycle stages and COUs (*e.g.,* manufacturing, processing, industrial use, commercial use, disposal) rather than a single distribution scenario. Data were not reasonably available for the Agency to assess risks to the environment from environmental releases and exposures related to distribution of DIBP in commerce as a single OES. However, EPA expects all the DIBP or DIBP-containing products and/or articles to be transported in closed system or otherwise to be transported in a form (*e.g.,* articles containing DIBP) such that there is negligible potential for releases except during an incident (*e.g.,* spill during transportation). Therefore, no separate assessment was performed for estimating releases and exposures from distribution in commerce.

5.3.4 Overall Confidence and Remaining Uncertainties Confidence in Environmental Risk Characterization

The overall confidence in the environmental risk characterization synthesizes confidence from environmental exposures and environmental hazards. Exposure confidence is detailed in the *Environmental Media, General Population, and Environmental Exposure Assessment for DIBP* (U.S. EPA, 2025v). Hazard confidence is detailed in the *Environmental Hazard Assessment for DIBP* (U.S. EPA, 2025t). Confidence determinations for reach group of environmental organisms characterized are provided in Table 5-5.

Environmental Exposure Confidence

Because of the lack of reported release data for facilities discharging DIBP to surface waters, releases were modeled, and the high-end release estimate for each COU was used for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant NAICS codes, and that had NPDES permits. EPA has overall slight to moderate confidence in the modeled concentrations as being representative of actual releases, with a slight bias toward overestimation when pairing lower flow rates with higher releases and assuming no wastewater treatment. The high-end modeled concentrations in the surface water and sediment exceeded the highest values available from monitoring studies by approximately three orders of magnitude. The difference between measured and modeled concentrations highlights the uncertainties associated with the conservative modeling approach and the difficulties in aligning monitoring data with facilities that might release DIBP. Monitoring studies can be found in the *Environmental Media, General Population, and Environmental Exposure Assessment for DIBP* (U.S. EPA, 2025v).

EPA has overall slight to moderate confidence in the release data and the resulting modeled surface water concentrations at the point of release in the receiving water body for those OESs in which surface water release was indicated, with a slight bias toward over-estimation. For the multimedia OESs in which the type of discharge did not specify the amount of water release, EPA has slight confidence in the applicability of the release data and the resulting modeled surface water concentrations.

DIBP did not have reasonably available facility reported release data for air deposition (*e.g.*, TRI or NEI). Therefore, DIBP releases were estimated and used as a direct input to the IIOAC Model. EPA has moderate confidence in the IIOAC-modeled results used to characterize exposures and deposition rates (U.S. EPA, 2025v). Information on the presence of DIBP in landfills is limited and there are uncertainties in the relevancy of the landfill leachate monitoring data to the COUs considered in this evaluation. However, as noted previously, no studies were identified that reported the concentration of DIBP in landfills or in the surrounding areas and DIBP is unlikely to be present in landfill leachates and migrate through groundwater. There is considerable uncertainty in the applicability of using generic release scenarios and wastewater treatment plant modeling software to estimate concentrations of DIBP in biosolids. There is limited reasonably available measured data on concentrations of DIBP in biosolids or soils receiving biosolids, and there is uncertainty that concentrations used in this analysis are representative of all types of environmental releases. However, the high-quality biodegradation rates and physical and chemical properties suggest that DIBP will have limited persistence potential and mobility in soils receiving biosolids. There is robust confidence that DIBP in soils will not be mobile and will have low persistence potential due to the high confidence in the biodegradation rates and physical and chemical properties.

Aquatic Species Overall Confidence

The overall confidence in the risk characterization for the aquatic assessment of DIBP for the modeled generic scenarios that indicated water release is slight to moderate. These release estimates are based on generic industrial release scenarios rather than reported release data; therefore, EPA has slight to moderate confidence that the full range of release estimates for generic scenarios capture high-end exposure scenarios. For the OES Manufacturing and Recyling, no RQs exceeded one at any flow scenario. Therefore, EPA has slight to moderate confidence that risk is not indicated by this OES. For seven OESs, there was insufficient information to determine the fraction of the release going to each of the reported media types, including to surface water as the modeled generic scenarios did not distinguish the amount or type of discharge (*i.e.*, landfill, incineration, surface water, or combination). These OES are: 1) Use of laboratory chemicals – solids, 2) Use of laboratory chemicals – liquids, 3) Use as a catalyst – formulation into pre-catalyst, 4) Application of paints and coatings, 5) Repackaging into large and small containers, 6) Application of adhesives and sealants, and 7) Use as a catalyst – intermediate in polypropylene manufacturing. For the multimedia OES Use as a catalyst – formation into pre-catalyst, existing facility release data through confidential business information supports the modeled P90 high-end release with no wastewater treatment surface water value as reflective of reasonable actual release. EPA has overall slight to moderate confidence for this OES. For the multimedia OES Use of Laboratory Chemicals – Solid, no RQs exceeded one at any flow scenario. Therefore, EPA has slight to moderate confidence that risk is not indicated by this OES. For the Application of paints and coatings, a sensitivity analysis showed that RQ > 1 across varied assumptions, therefore there is slight to moderate confidence that risk is indicated by this OES. For the remaining four OES, listed above, EPA has overall slight confidence.

Hazard confidence in the COCs for acute aquatic and sediment-dwelling organisms, chronic aquatic vertebrates, and chronic aquatic invertebrates was robust, while hazard confidence in the COCs for chronic sediment-dwelling invertebrates and aquatic plants and algae was moderate based on the quality of the database, strength and precision, dose response, and relevancy. For more information on the confidence values for hazard, see Section 2.4 in the *Environmental Hazard Assessment for DBP* (U.S. EPA, 2025t).

Terrestrial Species Overall Confidence

The overall confidence in the risk characterization for terrestrial mammals, soil invertebrates, and terrestrial plants is moderate. EPA has robust confidence in its qualitative assessment and conclusions pertaining to exposures from biosolids and landfills, and robust confidence in risk characterization conclusions based on its estimates of DBP air deposition to soil. Hazard confidence for soil invertebrates was robust and confidence for terrestrial mammals and terrestrial plants was moderate. For more information on the confidence values for hazard, see Section 2.4 in the *Environmental Hazard Assessment for DIBP* (U.S. EPA, 2025s). Terrestrial concentrations of DIBP are expected to be low and DIBP has low bioaccumulation and biomagnification potential in aquatic and terrestrial organisms and thus low potential for trophic transfer through food webs. Therefore, EPA has robust confidence in its screening level assessment conclusion that there is low potential for DIBP exposures to terrestrial mammals and plants. EPA has robust confidence that environmental DIBP exposures to terrestrial organisms will be far below the identified hazard values. EPA therefore has robust confidence in its risk characterization for terrestrial organisms.

Trophic Transfer Overall Confidence

EPA did not conduct a quantitative analysis of DIBP trophic transfer. Due to the physical and chemical properties, environmental fate, and exposure parameters of the DIBP, it is not expected to persist in surface water, groundwater, or air. DIBP has a water solubility of 6.2 mg/L, a log K_{OC} value of 2.67, an estimated BCF value of 30.2 L/kg, and a terrestrial biota-sediment accumulation factor (BSAF) between 0.18 and 0.46 kg/kg. DIBP is expected to have low bioaccumulation potential and no biomagnification potential and, therefore, expected to display trophic dilution. For further information on the sources of these values, please see *the Physical Chemistry and, Fate and Transport Assessment for DIBP* (U.S. EPA, 2025ag). Given the reasonably available data, EPA has robust confidence that that DIBP is found in relatively low concentrations (or not at all) in aquatic organism tissues, especially at higher trophic levels. Furthermore, DIBP has low bioaccumulation and biomagnification potential in aquatic and terrestrial organisms, and thus low potential for trophic transfer through food webs. EPA therefore does not expect risk from trophic transfer in wildlife at environmentally relevant concentrations of DIBP.

Table 5-5. DIBP Evidence Table Summarizing Overall Confidence Derived for Environmental Risk Characterization

Types of Evidence	Exposure	Hazard	Trophic Transfer	Risk Characterization Confidence
Aquatic				
Acute aquatic assessment	++ VVWM-PSC, Generic[a] + VVWM-PSC, Generic – Multimedia[b] + + + AERMOD[c]	+ + +	+ + +	Slight to moderate for generic scenarios that indicated water release, Slight for multimedia generic releases
Chronic aquatic vertebrate assessment		+ + +	+ + +	
Chronic aquatic invertebrate assessment		+ + +	+ + +	
Chronic sediment-dwelling assessment		+ +	+ + +	
Aquatic plants and algae assessment		+ +	+ + +	
Terrestrial				
Mammalian assessment	N/A (Not quantified)	+ +	+ + +	Robust
Soil invertebrate assessment	+ + + AERMOD	+ + +	+ + +	Robust
Terrestrial plant assessment	+ + + AERMOD	+ +	+ + +	Robust

[a] EPA conducted modeling VVWM-PSC tool to estimate concentrations of DBP within surface water and sediment.
[b] For some OESs, the modeled generic scenarios did not distinguish the amount or type of discharge (i.e., landfill, incineration, surface water, or combination). For these OESs, there was insufficient information to determine the fraction of the release going to each of the reported media types, including to surface water. EPA has slight confidence in the use of these generic releases for environmental risk characterization.
[c] EPA used AERMOD to estimate ambient air concentrations and air deposition of DBP from EPA-estimated releases.
+ + + Robust confidence suggests thorough understanding of the scientific evidence and uncertainties. The supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the risk estimate.
+ + Moderate confidence suggests some understanding of the scientific evidence and uncertainties. The supporting scientific evidence weighed against the uncertainties is reasonably adequate to characterize risk estimates.
+ Slight confidence is assigned when the weight of scientific evidence may not be adequate to characterize the scenario, and when the assessor is making the best scientific assessment possible in the absence of complete information. There are additional uncertainties that may need to be considered.

6 UNREASONABLE RISK DETERMINATION

TSCA section 6(b)(4) requires EPA to conduct a risk evaluation to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other nonrisk factors, including an unreasonable risk to a PESS identified by EPA as relevant to this risk evaluation, under the COUs.

EPA has determined that DIBP presents unreasonable risk of injury to human health driven by significant contributions to unreasonable risk from acute inhalation exposure to workers under four COUs (including risk to ONUs under 2 of these 4 COUs). The acute inhalation exposure to workers is the primary route contributing to the aggregate and cumulative exposure for workers.[11] EPA did not identify significant contributions to unreasonable risk to human health due to DIBP exposures to the general population or consumers.

EPA has determined that DIBP presents unreasonable risk of injury to the environment driven by significant contributions to unreasonable risk from chronic exposures via releases to surface water under a total of seven COUs (2 of which include risk to workers). This unreasonable risk determination is based on the information in previous sections of this risk evaluation, the appendices, TSDs, and supplemental files of this risk evaluation (see Appendix C) in accordance with TSCA section 6(b). In total, 9 out of the 28 COUs significantly contribute to the unreasonable risk from DIBP. This unreasonable risk determination and the underlying evaluation are consistent with the best available science (TSCA section 26(h)) and based on the weight of scientific evidence (TSCA section 26(i)).

EPA will initiate risk management for DIBP by applying one or more of the requirements under TSCA section 6(a) to the extent necessary so that DIBP no longer presents an unreasonable risk. The Agency expects risk management requirements to focus on those COUs that significantly contribute to the determination of unreasonable risk of DIBP. As the acute inhalation risk presented in the single chemical analysis is the driver of unreasonable risk, EPA's risk management will focus on the significant contributions to risk presented in the single chemical analysis of DIBP. EPA may select from among a suite of risk management options related to manufacture (including import), processing, distribution in commerce, commercial use, and disposal to address the unreasonable risk. The Agency could also consider whether such risk may be prevented or reduced to a sufficient extent by action taken under another federal law, such that referral to another agency under TSCA section 9(a) or use of another EPA administered authority to protect against such risk pursuant to TSCA section 9(b) may be appropriate.

Table 4-16 and Table 6-1 show that when PPE is used, the high-end and central tendency MOEs for all occupational COUs no longer indicate risk (see Section 4.3.2.3 for additional information). EPA does not have reasonably available information regarding use of PPE under the COUs; therefore, this unreasonable risk determination does not reflect use of PPE.

As noted in the Executive Summary, DIBP is used primarily as a plasticizer in consumer, commercial, and industrial applications (Section 1.1.2). It is also used as a stabilizing agent in the manufacturing of adhesives, paint, coatings, rubbers, and non-PVC plastic products. Workers may be exposed to DIBP when making these products or otherwise using DIBP in the workplace. When it is manufactured or

[11] The Agency conducted analyses on aggregate exposures and cumulative risks. Aggregate exposure analyses consider effects on populations that are exposed to DCHP via multiple routes (*e.g.*, dermal contact, ingestion, inhalation). Cumulative risk refers to human health risks related to exposures to multiple chemicals with similar effects (*i.e.*, aggregate + NHANES = cumulative). See Section 4.4 for more information.

used to make products, DIBP can be released into the water, where because of its properties, most of it will end up in the sediment at the bottom of lakes and rivers. If it is released into the air, DIBP will attach to dust particles and deposit on land or into water. Indoors, DIBP has the potential over time to migrate out of products and adhere to dust particles. If it does, people could inhale or ingest dust that contains DIBP.

EPA notes that human or environmental exposure to DIBP through uses not subject to TSCA (*e.g.*, cosmetics, use of shells and cartridges as identified in 26 U.S.C. § 4181 and food additives like food contact materials) were not evaluated by the Agency because these uses are explicitly excluded from TSCA's definition of a chemical substance. Thus, it is not appropriate to extrapolate from this risk determination to form conclusions about uses of DIBP that are not subject to TSCA, and that EPA did not evaluate.

Where relevant, the Agency conducted analyses on aggregate exposures and cumulative risks. Aggregate exposure analyses consider effects on populations that are exposed to DIBP via multiple routes (*e.g.*, dermal contact, ingestion, and inhalation). Cumulative risk analysis considers human health risks related to exposures to multiple chemicals EPA included DIBP in its cumulative risk analysis (CRA) TSD along with five other toxicologically similar phthalate chemicals (*i.e.*, DBP, BBP, DCHP, DEHP, and DINP that are also being evaluated under TSCA (U.S. EPA, 2025ap) based on the *Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* (U.S. EPA, 2025ap). This analysis allows EPA to assess the combined risk to health from multiple chemicals with similar effects simultaneously, recognizing that human exposure to phthalates is widespread and that multiple phthalates can disrupt development of the male reproductive system.

The full list of 28 COUs evaluated for DIBP are provided in Table 3-1 and Table 3-2**.** EPA is determining that the following nine COUs significantly contribute to unreasonable risk of injury to human health due to non-cancer risks from acute inhalation exposure to workers (2 include ONUs) or significantly contribute to unreasonable risk to the environment due to exposures to algae and chronic exposures to aquatic vertebrates via surface water:

- Industrial Use – Adhesives and sealants – Two-component glues and adhesives; transportation equipment manufacturing (inhalation exposure for workers and ONUs from spray applications) (human health);
- Industrial Use – Paints and coatings (inhalation exposure for workers from spray applications) (human health and environment);
- Commercial Use – Adhesives and sealants – Two-component glues and adhesives (inhalation exposure for workers and ONUs from spray applications) (human health);
- Commercial Use – Paints and coatings (inhalation exposure for workers from spray applications) (human health and environment);
- Processing – Incorporation into article – Plasticizers (plastic product manufacturing; transportation equipment manufacturing) (environment);
- Processing – Incorporation into formulation, mixture, or reaction product – Plasticizer (plastic product manufacturing) (environment);
- Processing – Incorporation into formulation, mixture, or reaction product – Solvents (which become part of product formulations or mixture) (plastic material and resin manufacturing) (environment);

- Processing – Incorporation into formulation, mixture, or reaction product – Processing aids, not otherwise listed (environment); and
- Processing – Incorporation into formulation, mixture, or reaction product – Pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production) (environment).

EPA did *not* identify significant contributions to unreasonable risk to human health or the environment from the following 19 COUs:

- Manufacturing – Domestic manufacturing;
- Manufacturing – Import;
- Processing – Incorporation into formulation, mixture, or reaction product – Foam pipeline pigs;
- Processing – Incorporation into formulation, mixture, or reaction product – Plastic and rubber products not covered elsewhere;
- Processing – As a reactant – Intermediate (plastic manufacturing);
- Processing – Repackaging – Repackaging (*e.g.,* laboratory chemicals);
- Processing – Recycling;
- Distribution in Commerce
- Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard);
- Commercial Use – Toys, playground, and sporting equipment;
- Commercial Use – Laboratory chemicals – Laboratory chemicals;
- Consumer Use – Adhesives and sealants – Adhesives and sealants;
- Consumer Use – Fabric, textile, and leather products not covered elsewhere (dermal exposures to consumers)
- Consumer Use – Floor coverings – Floor coverings;
- Consumer Use – Toys, playground, and sporting equipment – Toys, playground, and sporting equipment;
- Consumer Use – Paints and coatings – Paints and coatings;
- Consumer Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard); and
- Disposal.

For some COUs, such as Distribution in commerce, the Agency has limited reasonably available information to derive risk estimates, such as MOEs or RQs, to support a determination of whether the COU contributes to the unreasonable risk of injury to human health or the environment. In such cases, EPA integrated reasonably available information, such as physical-chemical properties and available monitoring data, in a risk characterization using a weight of evidence approach and professional judgment to support conclusions. The risk characterizations of COUs without risk estimates qualitatively present what EPA expects given the weight of scientific evidence without overstating the science.

The unreasonable risk determination must be informed by science and in making a finding of "presents unreasonable risk," EPA considers risk-related factors beyond exceedance of benchmarks. Risk-related factors include the type and severity of health effect under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.,* duration, magnitude, frequency of exposure), or population exposed—particularly populations with greater exposure or greater susceptibility (PESS)—and the confidence in the information used to inform the hazard and exposure values. EPA also considers, where relevant and appropriate, the Agency's analyses on aggregate exposures and cumulative risk. For COUs evaluated quantitatively, as described in the risk characterization, EPA based the unreasonable risk determination on the risk estimate that best represented the COU. In the risk evaluation, the Agency describes the strength of the scientific evidence supporting the human health and environmental assessments as robust, moderate to robust, moderate, slight to moderate, slight, or indeterminate.

Robust confidence suggests thorough understanding of the scientific evidence and uncertainties, and the supporting weight of scientific evidence outweighs the uncertainties to the point where it is unlikely that the uncertainties could have a significant effect on the risk estimates. Moderate confidence suggests some understanding of the scientific evidence and uncertainties, and the supporting scientific evidence weighed against the uncertainties is reasonably adequate to characterize risk. Slight confidence is assigned when the weight of scientific evidence may not be adequate to characterize the risk, and when the Agency is making the best scientific assessment possible in the absence of complete information. The designation of slight to moderate confidence suggests that some aspects of the analysis are reasonably adequate but that other aspects are not adequate or sufficiently understood to characterize the exposure. In general, EPA makes a determination of unreasonable risk based on risk estimates that have an overall confidence rating of moderate or robust because those confidence ratings indicate the scientific evidence is adequate to characterize risk estimates despite uncertainties or is such that it is unlikely the uncertainties could have a significant effect on the risk estimates.

This risk evaluation discusses important assumptions and key sources of uncertainty in the risk characterization; these are described in more detail in the respective weight of scientific evidence conclusions sections for fate and transport (Section 2.2), environmental release (Section 3.2.2), environmental exposures (Section 5.1), environmental hazards (Section 5.2), human health hazards (Section 4.2), human health risk characterization (Section 4.3), and Appendix F. It also includes overall confidence and remaining uncertainties sections for human health and environmental risk characterizations. In general, EPA makes an unreasonable risk determination based on risk estimates that have an overall confidence rating of moderate or robust because those confidence ratings indicate the scientific evidence is adequate to characterize risk estimates despite uncertainties or is such that it is unlikely the uncertainties could have a significant effect on the risk estimates.

6.1 Human Health

Calculated risk estimates (margin of exposure [MOEs[12]]) provide a risk profile of DIBP by presenting a range of estimates for different health effects for different COUs. When characterizing the risk to human health from occupational exposures during risk evaluation under TSCA, EPA conducts baseline assessments of risk and makes its determination of unreasonable risk in a manner that takes into consideration reasonably available information (*e.g.*, information submitted by manufacturers and processors of DIBP; multiple, representative site visits if relevant) regarding whether use of respiratory protection or other PPE is standard practice at all sites.[13] This allows EPA to make unreasonable risk determinations based on the information regarding workers wearing PPE where the Agency has confidence that the information is representative. In addition, the risk estimates are based on exposure scenarios with monitoring data that reflect existing requirements, such as those established by OSHA or industry sector best practices. In this risk evaluation, the risk estimates calculated reflect both use with and without PPE; including information on PPE that could be used to reduce exposures. However, EPA

[12] EPA derives non-cancer MOEs by dividing the non-cancer POD (HEC [mg/m^3] or HED [mg/kg-day]) by the exposure estimate (mg/m^3 or mg/kg-day). Section 4.2 has additional information on the risk assessment approach for human health.
[13] It should be noted that, in some cases, baseline conditions may reflect certain mitigation measures, such as engineering controls, in instances where exposure estimates are based on monitoring data at facilities that have engineering controls in place.

has limited information regarding existent appropriate and consistent use of PPE that would already address the unreasonable risk under the COUs. EPA received one public comment describing the use of engineering controls (*e.g.*, automated robotic spray systems and enclosed booths) and PPE (*e.g.*, air purify respirator) in the automotive manufacturing industry, but EPA cannot apply this information to other industrial sectors (EPA-HQ-OPPT-2018-0501-0122). Therefore, the risk determination is based on the risk estimates that do not reflect use of PPE.

To characterize risk from non-cancer endpoints, the estimated MOEs are compared to their respective benchmark MOE. The benchmark MOE accounts for the total uncertainty in a POD. The benchmark MOE is the total of several individual uncertainty factors relevant to a given POD with values usually of 1, 3, or 10. For DIBP, two uncertainty factors were used to derive a benchmark MOE: (1) UF_A of 3 for the uncertainty in extrapolating animal data to humans (*i.e.*, interspecies variability), and (2) UF_H of 10 for the variation in sensitivity among the members of the human population (*i.e.*, intrahuman/ intraspecies variability). Therefore, the benchmark MOE for DIBP is 30; is based on effects on the developing male reproductive system; and was used to characterize risk from exposure to DIBP for acute, intermediate, and chronic exposure scenarios. A lower benchmark MOE (*e.g.*, 30) indicates greater certainty in the data (because the total UF for the relevant POD is low). A higher benchmark MOE (*e.g.*, 100) would indicate more extrapolation uncertainty for specific hazard endpoints and scenarios. Additional information regarding the non-cancer hazard identification and the benchmark MOE is provided in Section 4.2.2 of this risk evaluation. An MOE that is less than the benchmark MOE is a starting point for informing a determination of unreasonable risk of injury to human health, based on assumptions that are used to develop the MOEs. It is important to emphasize that these calculated risk estimates alone are not “bright-line” indicators of unreasonable risk.

6.1.1 Populations and Exposures EPA Assessed to Determine Unreasonable Risk to Human Health

EPA has evaluated risk to workers (16+ years), including occupational non-users (ONUs) and female workers of reproductive age directly working with DIBP; consumers and bystanders (adults and children); and the general population (including fenceline communities)—all using reasonably available monitoring and modeling data for inhalation, dermal, and ingestion exposures, as applicable. EPA has evaluated risk from inhalation and dermal exposure of DIBP to workers. The Agency assessed the exposure of multiple occupational exposure groups, including workers who work in close proximity to DIBP and may handle DIBP and ONUs who do not directly handle DIBP but may be indirectly exposed to it as part of their employment. The Agency also has evaluated risk from inhalation, dermal, and ingestion exposures to consumers. For the general population, EPA has evaluated risk from the following: (1) ingestion exposure via drinking water, incidental surface water ingestion, fish ingestion (including subsistence and tribal fishers), and soil ingestion by children; (2) dermal exposure to surface water during swimming; (3) acute and chronic inhalation exposure; and (4) exposures measured through urinary biomonitoring (*i.e.*, NHANES data). EPA concluded it is not necessary to separately model risks to infants consuming the human milk of exposed individuals because the POD used in the assessment are based on fetal and infant effects following maternal exposure during the most sensitive periods of development. The Agency therefore has confidence that the risk estimates calculated based on maternal exposures are protective of a nursing infant’s greater susceptibility during this unique life stage whether due to sensitivity or greater exposure per body weight. Descriptions of the data used for human health exposure and human health hazards are provided in Sections 4.1 and 4.2. Uncertainties for overall exposures are presented in the respective occupational, consumer, and general population exposure sections of this risk evaluation and are considered in the unreasonable risk determination.

6.1.2 Summary of Human Health Effects

EPA is determining that the unreasonable human health risk presented by DIBP is due to non-cancer effects from acute inhalation exposure to workers. The acute inhalation exposure to workers is the primary route contributing to the aggregate and cumulative exposure for workers. These can be summarized as follows:

- workers from acute inhalation exposures; and
- ONUs from acute inhalation exposures.

For DIBP, EPA derived non-cancer risk estimates for occupational and consumer exposures using cumulative analysis, detailed in Section 4.4. Based on the weight of scientific evidence considerations outlined in the developed framework, EPA has weighed the strengths and uncertainties associated with the DIBP RPF (Approach 1) and the DIBP POD (Approach 2 and the single chemical DIBP risk evaluation). As explained in Section 4.4.3.1, EPA concluded that Approach 2 is most appropriate for the risk characterization of exposures and hazards and for the Agency's determination of unreasonable risk from DIBP.

EPA's cumulative approach adds non-attributable exposure (based on NHANES data that represent exposure to the general civilian population) to acute, aggregate DIBP exposures for females of reproductive age for each DIBP OES/COU. The cumulative analysis only considers acute exposures because evidence suggests health effects may result from a single phthalate exposure (see Section 1.5 of (U.S. EPA, 2025ap)). For other durations and populations, EPA considered risk estimates from DIBP alone.

EPA's exposure and overall risk characterization PODs and MOEs are summarized in Section 4.3, with specific health risk estimates for workers (including ONUs), consumers, bystanders, and the general population presented in Section 4.3.2 (workers), Section 4.3.3 (consumers and bystanders), Section 4.3.4 (general population), and Section 4.3.5 (PESS). Again, these MOEs and benchmarks are not bright-lines, and EPA has discretion to consider other risk-related factors when concluding whether a COU significantly contributes to the unreasonable risk.

Risk estimates based on the developmental toxicity POD are relevant for females of reproductive age and males at any life stage. Additionally, there is epidemiological evidence that DIBP exposure can adversely affect the developing male reproductive system consistent with phthalate syndrome in males of any age, with effects including decreases in anogenital distance (AGD) and testosterone and effects on sperm parameters in humans, and that DIBP exposure at higher concentrations can cause other health effects in females as well (see the *Non-Cancer Human Health Hazard Assessment for DIBP* (U.S. EPA, 2025ad). Therefore, EPA considers the selected POD to be relevant across sex, life stage, and durations. The Agency has robust overall confidence in the selected developmental toxicity POD. The confidence in the POD and descriptions of the data used to determine the human health effects from DIBP are explained in Section 4.2.2.

6.1.3 Basis for Unreasonable Risk to Human Health

In developing the exposure and hazard assessments for DIBP, EPA has analyzed reasonably available information to ascertain whether some human populations may have greater exposure and/or susceptibility than the general population to the hazard posed by DIBP. For the DIBP risk evaluation, EPA has accounted for the following PESS: females of reproductive age, pregnant women, male infants, male children, and male adolescents, people who frequently use consumer products and/or articles containing high concentrations of DIBP, people exposed to DIBP in the workplace, people in proximity to releasing facilities, including fenceline communities, and Tribes and subsistence fishers whose diets include large amounts of fish. Section 4.3.5 summarizes how PESS were incorporated into the risk evaluation through consideration of potentially increased exposures and/or potentially increased biological susceptibility and summarizes additional sources of uncertainty related to consideration of PESS.

EPA was able to calculate risk estimates for certain PESS groups (*e.g.*, female workers of reproductive age, and infants and children) (see Section 1.1.3). In past EPA risk evaluations, where EPA did not have specific PESS data, the Agency relied on high-end or conservative exposures to account for risk to PESS populations. However, because reasonably available data on PESS groups are included in the DIBP assessment, exposure estimates based on inputs and scenarios that are representative and/or likely to occur are generally protective of PESS and for DIBP, the more conservative high-end risk estimates were not needed in order to account for risk to PESS groups. Therefore, as explained in the human health risk characterization in Section 4.2.2, for some occupational COUs, central tendency risk estimates are the most appropriate for determining unreasonable risk because they are protective of PESS. The non-cancer POD EPA selected for DIBP for use in risk characterization is based on the most sensitive developmental effect (*i.e.*, reduced fetal testicular testosterone production) observed, and it is expected to be protective of susceptible subpopulations. Additionally, the UF_H of 10 for human variability that EPA has applied to MOEs accounts for possible increased susceptibility of some populations. More information on how EPA characterized sentinel and aggregate risks is provided in Section 4.1.5, and more information on how EPA characterized PESS risks is provided in Section 4.3.5.

EPA considered combined exposure across all routes of exposure for each occupational and consumer COU to calculate aggregate risks (Sections 4.3.2 and 4.3.3). The Agency aggregated exposures across routes for workers, including ONUs, and consumers for COUs with quantitative risk estimates. However, EPA did not consider aggregate exposure scenarios across COUs because the Agency did not find any evidence to support such an aggregate analysis, such as statistics of populations using certain products represented across COUs, or workers performing tasks across COUs based on the reasonably available information. See Section 4.1.5 for more information. EPA employed a risk screening approach for the general population exposure assessment.

In addition to the analysis done for DIBP alone (referred to as “individual analysis” or “single chemical analysis”), EPA applied both the methods and principles of CRA (*Draft Proposed Approach for Cumulative Risk Assessment (CRA) of High-Priority Phthalates and a Manufacturer-Requested Phthalate under the Toxic Substances Control Act* (U.S. EPA, 2023c), as well as the *Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA)* (U.S. EPA, 2025ap)), to derive non-cancer risk estimates for occupational and consumer exposures. EPA’s CRA includes cumulative exposure to other toxicologically similar phthalates being evaluated under TSCA (*i.e.*, DEHP, DBP, BBP, DCHP, and DINP) estimated from NHANES urinary biomonitoring data using reverse dosimetry. The risk estimate from this phthalate exposure is added to the aggregated dermal and inhalation risk estimates for DIBP exposures for each COU to derive cumulative MOEs. EPA has determined that the risk does not change significantly by adding the non-attributable cumulative exposure from NHANES to the single chemical risk estimates for DIBP; that is, cumulative exposure adds about 7.4 percent to the risk cup.

The NHANES exposure is non-attributable—meaning it cannot be attributed to specific COUs or other sources that may result in high-dose exposure scenarios (*e.g.*, occupational exposures to workers), but likely includes exposures attributable both to COUs assessed under TSCA and to other sources not subject to TSCA (*e.g.*, diet, food packaging, cosmetics). As explained in Section 4.4.3, based on the weight of scientific evidence considerations outlined in the developed framework for determining confidence in cumulative risk estimates (Table 4-21), EPA has weighed the strengths and uncertainties associated with the DIBP RPF (Approach 1) and the DIBP POD (Approach 2 and the single chemical DIBP risk assessment). EPA has more confidence in the DIBP POD (Approach 2) compared to the DIBP RPF (Approach 1) and therefore, has concluded that Approach 2 is more appropriate for use in risk characterization for DIBP. Approach 2 adds non-attributable exposures from other phthalates, *i.e.*, DEHP, DBP, BBP, DCHP, and DINP, as estimated from NHANES urinary biomonitoring data using reverse dosimetry, to acute BBP exposures for females of reproductive age. The NHANES exposure is non-attributable—meaning it cannot be attributed to specific COUs or other sources not subject to TSCA (*e.g.*, food packaging and/or medical devices) that may result in high-dose exposure scenarios (*e.g.*, occupational exposures to workers), but likely includes exposures attributable to both COUs and other sources not subject to TSCA (*e.g.*, diet, food packaging, cosmetics).

6.1.4 Basis for Unreasonable Risk to Workers

Based on the occupational risk estimates and related risk factors, EPA is determining that two COUs significantly contribute to the unreasonable risk from DIBP due to non-cancer risks from acute exposure for both workers and ONUs, and another two COUs for only workers. EPA assessed exposures that result from the manufacturing, processing, use, and disposal of DIBP, and assessed the exposure for the two occupational groups, workers and ONUs. (Workers work in close proximity to DIBP and may handle DIBP while ONUs do not directly handle DIBP but may be indirectly exposed to it as part of their employment.) For ONUs, because EPA did not have specific data on inhalation exposure, the Agency used worker central tendency exposure as representative of ONU exposure; dermal exposure to ONUs is modeled as incidental skin contact equal to the surface area of one palm. EPA evaluated the following exposures: inhalation exposure to vapor, mist and dust; dermal exposure to liquid and solids; aggregates of these exposures to DIBP, as well as cumulative exposure (including NHANES background phthalate exposure) for both workers and ONUs.

Risk estimates based on both high-end and central tendency exposures were considered for Spray application of adhesives and sealants. The high-end MOEs were used in determining unreasonable risk for acute inhalation exposures under the associated Industrial and Commercial Use COUs. Central tendency risk estimates were considered for intermediate and chronic inhalation exposure durations, as well as dermal exposure risk estimates for these two COUs. For all other COUs, EPA considered the central tendency risk estimates for inhalation and dermal exposures of all durations due to uncertainties associated with each OES mapped to occupational COUs, as described in Section 4.3.2.

Because systematic review of literature sources did not identify reasonably available inhalation monitoring data for multiple COUs EPA assessed the central tendency and high-end 8-hour TWA vapor inhalation exposure concentrations of these COUs to be equal to the corresponding values of the DIBP manufacturing COU. This means that for multiple COUs where no reasonably available information was identified describing the concentration of DIBP in mist in the workplace, the exposure and risk estimates are based on the conservative assumption that worker DIBP mist inhalation exposure concentration is equal to worker DIBP mist inhalation exposure concentration in the DIBP manufacturing COU. For other COUs, such as those associated with the spray application of adhesives and sealants and paints and coatings, EPA used SDSs to inform the inhalation concentrations. For more information on COUs using surrogate modeling, see Table 4-1.

For acute exposures in spray application scenarios under these four COUs, EPA used the high-end risk estimates in determining unreasonable risk:

- Industrial use – Adhesives and sealants;
- Commercial use – Adhesives and sealants;
- Industrial use – Paints and coatings; and
- Commercial use – Paints and coatings.

For these COUs, EPA considers it plausible that a confluence of variables (*e.g.*, low ventilation, high-demand work environment) could be present such that high-end exposure values exist throughout an 8-hour period of a work shift. The high-end exposure values are based on an 8-hour time weighted average exposure to the 95th percentile of spray mist data collected from a variety of spray gun types (*e.g.*, conventional, HVLP) and booth configurations (*e.g.*, cross draft, down draft) from the auto refinishing industry. EPA calculated concentrations of DIBP in mist that workers are potentially exposed to via inhalation using the Automotive Refinishing Spray Coating Mist Inhalation Model and SDSs and product data sheets.

For the Adhesive and sealant COUs, EPA identified 28 DIBP-containing adhesive and sealant products for these COUs. Although, based on the information in the data sheets alone, there is uncertainty that adhesive and sealant products containing DIBP are spray-applied, it cannot be ruled out; especially given public comment stating that DIBP is used in automobile manufacturing, identified in 37 parts, and as an adhesive (EPA-HQ-OPPT-2018-0434-0008). Based on the high-end MOEs for acute exposures (*i.e.*, 2.1 for average adult workers and 1.9 for females of reproductive age) and EPA's consideration of the risk-related factors (*e.g.*, the plausibility of the exposure scenario, the population exposed), EPA determined that the two COUs associated with the spray application of adhesives and sealants significantly contribute to the unreasonable risk. Additionally, although EPA considers high-end to be the appropriate risk estimates for the basis for these COUs, it is important to note that (1) the central tendency estimates for these uses also indicate risk, with MOEs below the benchmark (*i.e.*, 22 for average adult workers and 20 for females of reproductive age); and (2) these MOEs add additional support to EPA's determination.

For the Paints and coating COUs, the range of product concentrations was derived from known paint and coating products containing DIBP, and product SDS analysis resulted in a mode concentration of 5 percent and a maximum concentration of 60 percent. EPA used the 95th percentile mist concentration (*i.e.*, 22.1 mg/m^3) and the maximum product concentration (*i.e.*, 60%) to estimate the high-end exposure resulting in high-end MOEs for acute exposures are 2.1 for an average adult worker. However, these MOEs have increased uncertainty because they are based on the maximum concentration of DIBP (60%) and only one product was identified with that concentration. Through a secondary, refined analysis, the most common concentration of 5 percent was used. In this analysis, EPA used the mode concentration of 5 percent along with the 95th percentile mist concentration for the ESD on Coating Application via Spray-Painting in the Automotive Refinishing Industry, resulting in an estimated acute inhalation exposure level for an average adult worker as 0.55 mg/kg/day, which is associated with an MOE value of 10. With this refined, less conservative analysis, EPA is determining that these two COUs significantly contribute to DIBP's unreasonable risk to human health based on acute exposure to workers.

For EPA's risk determination for ONU inhalation exposure for adhesives and sealants and paints and coatings, EPA used worker central tendency data as analogous data for ONU exposure. Given the lack of ONU-specific data supporting a high-end 8-hour exposure scenario, there is uncertainty in whether high-end estimates to determine risk to ONUs from the spray application of adhesives and sealants and paints and coatings is appropriate or truly representative of an ONU exposure. However, if working within the same exposure area as those directly involved in the spray painting or application of spray adhesive at auto refinishing shops, central tendency exposure of an adult male worker (*i.e.*, the less sensitive population to females of reproductive age) is used as a surrogate. This central tendency exposure modeling assumes the mode product concentration of 5 percent and the 50th percentile mist concentration. For the industrial and commercial use of adhesives and sealants COUs, the acute central tendency MOE of 22 indicates risk for ONUs, and the central tendency MOEs are not based on modeling with levels of uncertainty or conservative assumptions that would outweigh this MOE. Therefore, EPA's determination that the commercial and industrial use of adhesives and sealants significantly contributes to unreasonable risk is also supported by acute inhalation exposures to ONUs in spray application scenarios (but not intermediate or chronic). The Agency is not determining that the industrial and commercial uses of paints and coatings significantly contributes to the unreasonable risk to ONUs, as those MOEs were well above the benchmark (*e.g.*, MOE of 135 for acute ONU exposure).

All four of these COUs were also modeled for *non-spray* application. Under the assumptions and modeling for non-spray application, all MOEs at all durations were well above the benchmark, ranging from 11,400 to 17,935 for ONUs and for workers at central tendency.

As previously discussed, due to the lack of DIBP exposure data and potential conservatisms built into the modeled estimates (*e.g.*, the use of the manufacturing release for most OESs), EPA considered central tendency for all other COUs. The central tendency MOEs were all 75 or above and did not indicate risk. Additionally, the CRA did not push any MOE to support finding of unreasonable risk. Therefore, EPA is determining that no other COUs significantly contribute to unreasonable risk of DIBP to workers.

Dermal exposure risk estimates for COUs were analyzed using acute, intermediate, and chronic scenarios. Unreasonable risk is not indicated at central tendency or high-end for any dermal exposure scenarios of any COU. Additional information on occupational risk estimates is provided in Section 4.3.2 of this risk evaluation.

EPA assessed one occupational COU without deriving risk estimates: Distribution in commerce. EPA expects DIBP to be transported in sealed containers from import sites to downstream processing and use sites, or for final disposal. EPA expects under standard operating procedures, along with the expectation that DIBP would be transported in a closed system, that there is negligible potential for releases. Therefore, no occupational exposures are reasonably expected to occur, and EPA is determining that DIBP exposures and releases that could occur during distribution in commerce do not significantly contribute to the unreasonable risk.

EPA has moderate confidence overall in the risk estimates calculated for females of reproductive age and average adult workers inhalation and dermal exposure scenarios. The Agency has slight to moderate confidence in the assessed inhalation exposures for ONUs and slight to moderate confidence in the assessed ONU dermal exposures. Further information on EPA's confidence in these risk estimates and the uncertainties associated with them can be found in Section 4.3.2.1.

For the cumulative analysis, EPA has moderate confidence in the inhalation and dermal exposures estimates for the assessed OESs. EPA has robust confidence in the DIBP POD and in the non-attributable cumulative exposure estimates for BBP, DBP, DEHP, DIBP, and DINP derived from NHANES urinary biomonitoring data using reverse dosimetry.

6.1.5 Basis for Unreasonable Risk to Consumers

Based on the consumer risk estimates and related risk factors, EPA is determining that consumer uses do not significantly contribute to the unreasonable risk of DIBP.

Between the draft DIBP risk evaluation (U.S. EPA, 2025r) and this final risk evaluation, EPA revised its dermal analysis for DIBP. The Agency recalculated all liquid products and solid articles dermal exposure doses and MOEs from draft to final. After receiving public feedback regarding the availability of additional dermal absorption studies provided during the SACC review, EPA used the DBP dermal approach as an appropriate surrogate for DIBP liquid products dermal exposure assessment, since no studies directly evaluating DIBP were available for this analysis. After feedback from SACC and public comment, EPA also identified a more representative study that incorporated metabolically active human skin and a biologically relevant receptor fluid (Beydon et al., 2010). The study by Scott et al. (1987), that was previously used as read across from DBP to calculate dermal exposure, used an ethanol mixture as the receptor fluid, and the study did not use metabolically active skin. Therefore, the absorption data reported by Beydon et al. (2010) for DBP was used as a DIBP surrogate and is preferable to the absorption data reported by Scott et al. (1987). In the absence of reasonably available DIBP and DBP solid matrices dermal absorption studies, EPA modeled solid articles dermal exposures as described in Section 4.1.2.1.2 and in more detail in U.S. EPA (2025g).

Under the COUs, EPA assessed consumer risk from inhalation, ingestion, and dermal exposures, as well as aggregated exposure from these three routes and from cumulative exposure (including NHANES background phthalate exposure) for various scenarios involving DIBP-containing products and articles. Consumer and bystander populations assessed were infants (<1 year), toddlers (1–2 years), preschoolers (3–5 years), middle childhood (6–10 years), young teens (11–15 years), teenagers (16–20 years), and adults (21+ years). Additionally, EPA decreased uncertainty by selecting use pattern inputs that represent product and article use descriptions and furthermore capture the range of possible use patterns in the high-, medium- and low-intensity use scenarios. The suitability of the exposure intensity scenario depended on the various exposure assumptions or uncertainties (as discussed in more detail below).

Two consumer COU had MOEs suggesting unreasonable risk, but EPA determined that they do not contribute to unreasonable risk for the reasons discussed below.

First, EPA is determining that the COU, Consumer use – Fabric, textile, and leather products, not covered elsewhere (*e.g.*, textile [fabric] dyes) does not significantly contribute to unreasonable risk. Four different article scenarios were assessed for this COU: (1) children's clothing, (2) synthetic leather clothing, (3) textile furniture components; and (4) small articles with potential for semi-routine contact. For the scenario of children's clothing there were 11 types of clothing items identified (*e.g.*, bodysuits, tops, bottoms, underwear, belts, and variety packs) and DIBP was associated with various components including inks/dyes/pigments, synthetic polymers, bio-based materials and textiles (WSDE, 2020). The reported weight fractions of DIBP in children's clothing ranged from 0.0001 to 0.005 w/w, with eight of those values reported as 0.0001 w/w (U.S. EPA, 2025f). Dermal exposures were assessed for the acute duration of 1 day and the chronic duration of 365 days per year. The expected uses of these various clothing items (*e.g.*, bodysuits, tops, bottoms) align with the assumptions about exposure such as contact area, and duration used in the high intensity use scenario (*i.e.*, 480 minutes [8 hours] and 50% of skin contact). In comparison, the medium-intensity scenario for children's clothing (*i.e.*, 240 minutes [4 hours] and 25% of face, hands, and arms) better represents items like raincoats and accessories, which are assumed to have lower contact area and duration used than other clothing types. EPA has robust confidence that the high- and medium-intensity use scenario inputs accurately represent expected/actual use patterns (*e.g.*, duration of contact and surface area in contact with the skin) in the ways described above.

Given the high intensity exposure scenario, the initial screening assessment had MOEs at or below the benchmark of 30 for all relevant populations. However, there is uncertainty with respect to the modeling of dermal absorption of DIBP from solid matrices or articles. EPA assumed in the initial screening-level assessment, that the dermal absorption of DIBP from solid objects would be limited by the aqueous solubility of DIBP, which serves as reasonable upper bound (*i.e.*, the initial assessment assumed there is as much DIBP on the skin as can be absorbed). The Agency performed an additional refinement known as the "solid-phase diffusion analysis," to provide context for the potential degree of this overestimation of risk and to be able to consider the migration of DIBP out of the clothing/how much DIBP is available on the skin for absorption. This additional solid-phase diffusion analysis also allowed EPA to take into consideration the DIBP concentration/weight fraction in the clothing as well as the transfer efficiency. Using the rates of transfer of DIBP to the clothing surface and the transfer efficiencies from clothing to skin, EPA estimated the potential rate of dermal absorption from higher concentration DIBP-containing clothing items. The Agency found that for the high-intensity exposure scenario (480 minutes of exposure with 50% of body surface area in contact with clothing), even with the highest reported weight fraction of DIBP in clothing (*i.e.*, 0.005 w/w), the associated dermal MOE values range from 49 to 90 for infants through young teens for an acute 1-day exposure.

Ultimately, the initial screening-level assessment for dermal exposure to children's clothing overestimated the amount of DIBP present on the skin, as it assumed there was as much DIBP on the skin (*i.e.*, saturation) as could be absorbed. The results of the refined solid-phase diffusion analysis have shown that even for the highest intensity exposure scenario, the use of children's clothing is not expected to lead to risk values below the benchmark MOE of 30 for any scenario or population. Furthermore, children are not expected to experience these conditions repeatedly on a chronic basis, and because there is a finite amount of DIBP in clothing, the amount of DIBP present will decline with repeated use and washing. As a result, EPA determined that this COU does not significantly contribute to unreasonable risk from acute, chronic exposures. Note that risk was also not indicated under the other three product/article scenarios assessed for this COU. See Sections 4.3.3 and 4.4.5 for further characterization of the solid-phase diffusion analysis and a description of the uncertainties surrounding dermal modeling of DIBP articles.

Second, the COU Consumer use – Floor coverings – Floor coverings, resulted in MOEs below the benchmark based on the high intensity exposure scenario for acute and chronic inhalation and aggregate exposure. However, in the high-intensity use scenario for inhalation exposure, one of the two different article scenarios assessed (vinyl flooring) assumed among other things, that the entirety of the house flooring contained DIBP, that the vinyl flooring contained the maximum reported value of 0.074 w/w, and that exposed children spent 20 hours per day in the home (*i.e.*, 20 hours in the environment where the flooring is present). Although this high-intensity exposure scenario is possible, the confluence of these factors (*e.g.*, 100% DIBP vinyl flooring and the highest weight fraction identified of 0.074 w/w) may be an upper-bound; ultimately, EPA is uncertain and lacks supporting evidence of the widespread use of vinyl flooring coverage in homes. The medium- and low-intensity use scenarios allow for the presence of other floor coverings in addition to vinyl flooring (50 and 25% of floor coverage respectively) and flooring with lower weight fractions of DIBP (5.6×10^{-5} and 0.026 w/w), which may be a better representation of average U.S. homes. EPA recommends the consideration of the acute and chronic vinyl flooring inhalation medium-intensity use exposure scenarios, which considers a smaller vinyl flooring coverage in homes. The MOEs from the medium use scenarios are all almost twice the benchmark or greater (*i.e.*, 57 or above) across all exposure routes, durations, and populations. See

Sections 4.3.3 and 4.4.5 for the complete list of risk estimates. When considering the appropriateness of the assumptions associated with the high intensity scenario and the risk estimates of the medium-intensity use scenarios, EPA determined that this COU does not significantly contribute to unreasonable risk.

As described in Section 4.1.2.4, and in more detail in the *Consumer and Indoor Exposure Assessment for DIBP* (U.S. EPA, 2025e), EPA has moderate and robust confidence in the assessed inhalation, ingestion, and dermal consumer exposure scenarios, and robust confidence in the non-cancer POD selected to characterize risk from acute, intermediate, and chronic duration exposures to DIBP (see Section 4.2 and (U.S. EPA, 2025ad)). The exposure estimates used to estimate risk relied on conservative, health-protective inputs and parameters that are considered representative of a wide selection of use patterns. Overall, EPA has moderate or robust confidence in the risk estimates calculated for consumers inhalation, ingestion, and dermal exposure scenarios. The overall confidence considers confidence in the approach and the inputs used in the calculations.

6.1.6 Basis for No Unreasonable Risk to the General Population

Based on the risk estimates, EPA did not identify significant contributions to risk to the general population from the following exposure routes and pathways for DIBP:

- exposure via the land pathway (*i.e.,* application of biosolids and landfills);
- incidental ingestion and dermal contact from swimming;
- acute and chronic ingestion of drinking water;
- acute and chronic ingestion exposure from fish ingestion;
- acute and chronic inhalation exposure to ambient air in proximity to releasing facilities, including fenceline communities; and
- soil ingestion exposure from air deposition to soil.

EPA employed a screening-level approach for general population exposures for DIBP because of limited environmental monitoring data for DIBP and lack of location data for DIBP releases. If risks were not indicated for an individual (adult, infant, etc.) identified as having the potential for the highest exposure associated with a COU for a given pathway of exposure (*i.e.*, at high-end or the 95th percentile), then that pathway was determined not to significantly contribute to the risk and was not further analyzed. Also, as a part of EPA's screening-level approach, the Agency considered the environmental concentration of DIBP in a given environmental medium resulting from the OES (*e.g.*, PVC plastics compounding) that had the highest release compared with any other OES for the same releasing media. Release estimates from OESs resulting in lower environmental media concentrations were not considered for this screening-level assessment. EPA did not evaluate cumulative risk for the general population from environmental releases because after using the previously described conservative screening-level approach, the Agency did not identify any pathways of concern, indicating that refinement and further evaluation were not necessary. EPA evaluated surface water, sediment, drinking water, fish ingestion, and ambient air pathways quantitatively, and land pathways (*i.e.*, landfills and application of biosolids) qualitatively (see Section 4.1.3).

As stated in Section 4.3.4, EPA evaluated surface water, drinking water, fish ingestion, and ambient air pathways quantitatively using a screening level approach for DIBP releases associated with COUs (see the *Environmental Media, General Population, and Environmental Exposure for DIBP* (U.S. EPA, 2025v) and Section 4.1.3 for additional details about the assessment and assessment process). Land pathways (*i.e.*, landfills and application of biosolids) were assessed qualitatively for down-the-drain releases of consumer products and landfill disposal of consumer articles (see Section 3.1.3 for details on the qualitative assessment of consumer disposal of DIBP-containing products and articles). For pathways assessed quantitatively, high-end estimates of DIBP concentration in the various environmental media were used for screening level purposes. EPA used an MOE approach using high-end exposure estimates to determine whether an exposure pathway had potential non-cancer risks. High-end exposure estimates were defined as those associated with the industrial and commercial releases from a COU and OES that resulted in the highest environmental media concentrations.

Therefore, if there is no risk for an individual identified as having the potential for the highest exposure associated with a COU for a given pathway of exposure, then that pathway was determined not to be a pathway of concern and not pursued further. Based on the screening level approach described in Section 4.1.3 and the qualitative assessment of landfill and biosolids pathways described in Section 3.1.3, EPA did not identify significant contributions to unreasonable risk to the general population from exposure to DIBP through biosolids, landfills, surface water, drinking water, fish ingestion, or ambient air for any COU listed in Table 3-1.

EPA has moderate to robust confidence that the risk estimates calculated for the general population were conservative and appropriate for a screening level analysis, as described in Section 4.3.4.1. EPA also has robust confidence that modeled releases used are appropriately conservative for a screening level analysis. Therefore, the Agency has robust confidence that no exposure scenarios will lead to greater doses than presented in this risk evaluation. Furthermore, many of the acute dose rates or average daily doses from a single exposure scenario exceed the total daily intake values estimated in Section 4.1.3.2 using NHANES data, adding further confidence that the exposure estimates captured high-end exposure scenarios and were appropriately conservative.

6.2 Unreasonable Risk to the Environment

Based on the risk evaluation for DIBP—including the risk estimates, the environmental effects of DIBP, the exposures, physical and chemical properties of DIBP, and consideration of uncertainties—EPA determined that DIBP presents unreasonable risk of injury to the environment driven by significant contributions to unreasonable risk from chronic exposures to aquatic organisms in surface water from seven COUs out of the 28:

- Processing – Incorporation into article – Plasticizers (plastic product manufacturing; transportation equipment manufacturing);
- Processing – Incorporation into formulation, mixture, or reaction product – Plasticizers (adhesive manufacturing; plastic product manufacturing);
- Processing – Incorporation into formulation, mixture, or reaction product – Solvents (which become part of product formulations or mixture);
- Processing – Incorporation into formulation, mixture, or reaction product – Processing aids, not otherwise listed;
- Processing – Incorporation into formulation, mixture, or reaction product – Pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production).
- Industrial Use – Paints and coatings; and
- Commercial Use – Paints and coatings.

For environmental pathways that were quantitatively assessed, EPA evaluated whether the potential releases and resultant exposures of DIBP in surface water, sediment, or soil will exceed the concentrations that result in hazardous effects for aquatic, benthic, or terrestrial organisms. If the exposure for the COU with the highest amount of environmental release (*i.e.,* the COU with the highest environmental exposures, the most conservative exposure estimates) did not exceed the hazard threshold for aquatic or terrestrial organisms, it was determined that exposures due to releases from other COUs would not lead to environmental risk via that pathway. If the analysis indicated risk, then the next-highest releasing exposure scenario was evaluated until all COUs were characterized.

EPA characterized the environmental risk of DIBP using risk quotients (RQs) for 17 COUs, which compare the predicted environmental concentration with hazard threshold values. Calculated RQs can provide a risk profile by presenting a range of estimates for different environmental hazard effects for different COUs. An RQ equal to 1 indicates that the exposure estimated for the given scenario is the same as the concentration that potentially causes adverse effects. An RQ less than 1, when the exposure is less than the effect concentration, generally suggests that a risk of injury to the environment that would support a determination of unreasonable risk is not indicated. An RQ exceeding 1, when the exposure is greater than the concentration of concern, indicates that there could be a risk of injury to the environment that would support a determination of unreasonable risk for DIBP, based on the parameters and assumptions assessed to generate that RQ. Additionally, if a chronic RQ is 1 or greater, the Agency evaluates whether the chronic risks are indicated for the exposure period of the underlying hazard toxicity tests before making a determination of unreasonable risk.

Consistent with EPA's determination of unreasonable risk to human health, the RQ is not treated as a bright-line, and other risk-based factors may be considered (*e.g.,* confidence in the hazard and exposure characterization, duration, magnitude, uncertainty) for purposes of making an unreasonable risk determination.

EPA qualitatively evaluated 11 COUs without RQs by integrating limited amounts of reasonably available information using professional judgment of read-across evidence. EPA expects exposure to organisms via all pathways from the Distribution in commerce COU to be negligible, and the Agency has determined it does not contribute to the unreasonable risk to the environment. For all environmental pathways, EPA has determined that three COUs do not significantly contribute to the unreasonable risk based on a qualitative assessment of the Fabrication or use of final products or articles OES, indicating that environmental releases are expected to be minimal and dispersed. Also, the Agency assessed risk from the six Consumer use COUs and the Disposal COU qualitatively for both the land pathway from biosolids and landfills and down-the-drain disposals. As detailed in Section 5.3.3, releases from these COUs would be negligible. EPA determined that these 11 COUs do not significantly contribute to unreasonable risk to the environment. The qualitative analyses are a best estimate of what EPA expects given the weight of scientific evidence without overstating the science. Further information about how COUs were assessed for risk to the environment is summarized in Table 5-1 and Section 5.3 of this risk evaluation.

6.2.1 Populations and Exposures EPA Assessed for the Environment

DIBP is expected to be released to the environment via air, water, biosolids, and disposal to landfills. It is expected to show strong affinity and sorption potential in organic carbon in soil and sediment, and when released to air, DIBP is expected to adsorb to particulate matter. In water, DIBP is expected to mostly partition to suspended organic matter and aquatic sediments (U.S. EPA, 2025ag). However, DIBP is not expected to undergo long-range transport and is expected to be found predominantly in sediments near point sources. EPA conducted a quantitative analysis for risks of DIBP via surface water, sediment, and air deposition to soil. Because concentrations of DIBP in soil (biosolids, landfills) and air are limited or are not expected to be bioavailable, groundwater concentrations resulting from releases from landfills or from agricultural lands via biosolids applications were not quantified but are discussed qualitatively in Section 5.3.

EPA expects the main environmental exposure pathway to be to aquatic species from releases to surface water and subsequent deposition to sediment. Releases to ambient air and subsequent deposition to water and sediment have a limited contribution to environmental exposure for aquatic organisms. Based on the water solubility and hydrophobicity of DIBP, it is not expected to have potential for significant bioaccumulation, biomagnification, or bioconcentration in exposed organisms. Therefore, DIBP has low potential for trophic transfer through food webs. As detailed in Section 5.2, concentrations of concern were derived for several aquatic receptors in surface water for DIBP—including acute and chronic exposures to aquatic vertebrates, aquatic invertebrates, and benthic invertebrates, and aquatic plants and algae.

Due to the lack of reasonably available release data for facilities discharging DIBP to surface waters, releases were modeled, and the high-end estimate for each COU was applied for surface water modeling. Additionally, due to the lack of reasonably available site-specific release information, a generic distribution of hydrologic flows was developed from facilities that had been classified under relevant NAICS codes and that had NPDES permits. EPA has slight to moderate confidence in the modeled concentrations' being representative of actual releases, with a slight bias toward over-estimation when pairing lower flow rates with higher releases and assuming no wastewater treatment. Uncertainty in the weight fractions of DIBP in products may lead to environmental concentration estimates that underestimate or overestimate actual concentrations. This contributes to uncertainty in the risk estimates but not any bias towards over- or underestimation. Additionally, EPA has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation based on the conservative assumptions used for the screening analysis.

A total of nine COUs were modeled with generic scenarios that did not specify the apportionment of discharges across multiple media (*i.e.,* landfill, incineration, or surface water), eight of which had insufficient information to determine the fraction of DIBP released to each of the reported media types, including to surface water. EPA has developed a sensitivity analysis that considers potential risk as a result of an assumed proportion of 0.01 to 100 percent of the total release from each of these COUs being released to surface water with and without wastewater treatment (up to 90% removal) to model exposures. EPA has slight confidence in the exposures for these COUs. However, the overall weight of evidence is slight to moderate for three COUs (*i.e.,* Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production); Industrial use – paints and coatings; and Commercial use – paints and coatings) due to the consideration of the additional sensitivity analysis and industry submitted data. More details on EPA's environmental risk characterization can be found in Section 5.3.

6.2.2 Summary of Environmental Effects

EPA is determining that seven COUs significantly contribute to unreasonable risk to the environment from DIBP due to the following effects:

- for algal population reduction (based on a study with a duration of 48 hours);
- for mortality, growth, reproduction, and development for aquatic vertebrates (chronic); and
- for mortality, growth, reproduction, and development for aquatic and benthic invertebrates (chronic).

Acute effects to aquatic animals and effects to terrestrial organisms from air deposition to soil, application of biosolids, leaching from landfills, and from trophic transfer do not contribute to the unreasonable risk to the environment presented by DIBP.

6.2.3 Basis for Unreasonable Risk to the Environment

For the surface water pathway, EPA conducted modeling to assess the expected resulting surface water concentrations from the COUs. Due to the partitioning of the compound to sediment, wastewater treatment is expected to be moderately effective at removing DIBP from the water column prior to discharge, and treatment was modeled with a removal efficiency of 68 percent, with additional analysis assuming efficiency up to 90 percent (Section 5.3). Modeled releases were assumed to be released to surface water with treatment, unless the type of discharge (Table 3-6) indicated that it may go direct to surface water. For these seven COUs listed below, water concentrations are reported both with and without wastewater removal treatment, and because there is no direct evidence that wastewater treatment is more likely or less likely than direct release, EPA's risk determination considers both scenarios.

EPA is determining that the following seven COUs significantly contribute to unreasonable risk to environment from DIBP; four COUs have release to water and specify the apportionment of discharges across multiple media:

- Processing – Incorporation into formulation, mixture, or reaction product – Plasticizers (Plastics compounding OES);
- Processing – Incorporation into formulation, mixture, or reaction product – Processing aids, not otherwise listed (Plastics compounding OES);
- Processing – Incorporation into formulation, mixture, or reaction product – Solvents (Plastics compounding OES and Incorporation into paints and coatings OES); and
- Processing – Incorporation into an article – Plasticizers (Plastics converting OES).

Three COUs have releases which do not specify the apportionment of discharges across multiple media:

- Processing – Incorporation into formulation, mixture, or reaction product – Pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production);
- Industrial use – Paints and coatings; and
- Commercial use – Paints and coatings.

COUs with an Apportionment of Discharges Across Multiple Media

Of these seven COUs that significantly contribute to the unreasonable risk, EPA's risk determination for the three COUs associated with the Plastic compounding OES is based on risk estimates with and without treatment and a medium flow rate of P75 (634,500 m^3/day). For chronic exposure to vertebrates, RQs are 11.73 with central tendency releases and 57.8 high-end, reduced to 3.75 and 18.5 with wastewater treatment (68%). For algae, RQs exceed 1 for both central tendency (4.37) and high-end (21.5) release estimates. When wastewater treatment is applied (*e.g.,* on-site treatment or discharge to POTW) the RQs remain above 1 (1.40, 6.89). EPA acknowledges there are uncertainties in these (and all) risk estimates, and as explained earlier in this section there is a slight bias toward over-estimation of RQs when pairing lower flow rates with higher releases and assuming no wastewater treatment. The RQ of 1.40 for exposure to algae is based on lower releases with wastewater treatment, so there is no evidence that actual exposures exceeding the COC by less than 40 percent is more likely than exposures exceeding the COC by more than 40 percent. Despite uncertainties, it is much more likely that the RQ is greater than 1 than less than 1 for this less conservative scenario. Because there is no direct evidence that wastewater treatment is more likely than not or that high-end releases are not plausible, EPA considered the RQ of 1.4 as part of the broader set of RQs that are all significantly higher.

One of these three processing COUs described in the previous paragraph, Processing – incorporation into formulation, mixture, or reaction product – solvents, is also modeled with the Incorporation into paints and coatings OES. Using that OES with central tendency releases, P75 flows, and wastewater treatment, chronic exposure to vertebrates has an RQ of 2.15. Note that chronic RQs are based on a study with 30 days of DIBP exposure, and as noted in Section 5.3.2, all chronic RQs indicating risk exceeded 1 for more than 30 days. EPA acknowledges there are uncertainties in these (and all) risk estimates, and as explained earlier in this section there is a slight bias toward over-estimation of RQs when pairing lower flow rates with higher releases and assuming no wastewater treatment. The RQ of 2.15 for chronic exposure to vertebrates is based on lower releases with wastewater treatment, so there is no evidence that actual exposures exceeding the COC by less than 115 percent is more likely than exposures exceeding the COC by more than 2.15 times. Despite uncertainties, it is much more likely that the RQ is greater than 1 than less than 1 for this less conservative scenario. There is no direct evidence that wastewater treatment is more likely than not or that high-end releases are not plausible, so EPA considered the RQ of 2.15 as part of the broader set of RQs that are all significantly higher. Therefore, EPA is determining that these three COUs significantly contribute to unreasonable risk to the environment due to exposures to DIBP in surface water causing effects on algae and chronic effects on aquatic vertebrates.

In addition to the three previously discussed COUs, EPA identified another processing COU which significantly contributes to unreasonable risk, Processing – incorporation into an article – plasticizers. For this COU, EPA's risk determination is also based on risk estimates based on P75 flow rates both with and without wastewater treatment. For algae, RQs exceed 1 for both central tendency (1.53) and high-end (6.66) release estimates. When wastewater treatment is applied (*e.g.*, on-site treatment or discharge to POTW) the RQ remains above 1 at high end only (2.13). For chronic exposure to vertebrates, RQs are 4.12 with central tendency releases and 17.9 high-end, reduced to 1.32 and 5.72 with wastewater treatment. EPA acknowledges there are uncertainties in these (and all) risk estimates, and as explained earlier in this section there is a slight bias toward over-estimation of RQs when pairing lower flow rates with higher releases and assuming no wastewater treatment. The RQ of 1.32 for chronic exposure to vertebrates is based on lower releases with wastewater treatment and the RQ for algae assumes lower releases, so a slight bias toward overestimation is not expected for these RQs. There is no direct evidence that wastewater treatment is more likely than not or that high-end releases are not plausible, meaning there is not a data-driven justification for giving the RQs of 1.32 and 1.53 greater weight in EPA's determination of risk than the RQs of 6.66 and 17.9. Therefore, EPA determined that this COU significantly contributes to unreasonable risk to the environment due to exposures to DIBP in surface water causing effects on algae and chronic effects on aquatic vertebrates. Of the eight different combinations of flow rates, receptor, and wastewater treatment that EPA considered, the scenario of algae with lower releases and wastewater treatment assumed had an RQ below 1, so EPA's determination that this COU significantly contributes to unreasonable risk is more strongly supported by vertebrate risks than by risks to algae.

Lastly, there are two COUs in this grouping (*i.e.*, COUs that specify the apportionment of discharges across multiple media) not listed above as they do not significantly contribute to unreasonable risk to DIBP. Processing – incorporation into formulation, mixture, or reaction product – foam for pipeline pigs and Processing – incorporation into formulation, mixture, or reaction product – plastic and rubber products not covered elsewhere are each modeled using two scenarios. All RQs for aquatic invertebrates and algae are below the benchmark of 1 using high-end releases. While the chronic vertebrate RQs using P75 flows ranged from 0.33 to 1.48 across these scenarios, central tendency RQs are 1.03 and 1.10 with wastewater treatment and are well below the benchmark with treatment using high-end releases. RQs for a number of the different scenarios modeled were less than 1, and some of the RQs greater than 1 are not so much greater than 1 that the RQs can be certain to indicate risk even in light of conservatisms and uncertainties, in keeping with the fact that the benchmark is not a bright-line for risk. Given the uncertainties in releases and flows, and conservative elements in the concentration modeling, as well as the full set of RQs for different plausible scenarios, EPA determined that these two COUs do not significantly contribute to unreasonable risk to the environment.

The previously discussed COUs had some releases associated with multiple media types (wastewater to onsite treatment, discharge to POTW [with or without pretreatment], direct to surface water, incineration, or landfill), but also had releases categorized specifically to water (wastewater to onsite treatment, discharge to POTW [with or without pretreatment]). EPA estimated surface water concentrations for these COUs using only the releases categorized specifically to water and did not consider the releases associated with the multiple media types, which may have resulted in an underestimation of risk. Additionally, there is uncertainty in the representativeness of estimated release values toward the true distribution of potential releases at all sites for the use. There is also uncertainty in the representativeness of generic flow scenarios of actual releases from real-world sites that compound DIBP into plastic resin (U.S. EPA, 2025v). EPA has slight to moderate confidence in the modeled concentrations being representative of actual releases, with a minor bias toward over-estimation when wastewater treatment is assumed along with high-end releases and low flows. The Agency has robust confidence that it is unlikely that other surface water release scenarios result in water concentrations that exceed the concentrations presented in this evaluation due to the conservative assumptions used in the initial screening analysis.

The Domestic manufacturing and Recycling COUs had RQs below 1 for all releases, flow rates, and wastewater treatment options. Unreasonable risk to the environment is not indicated for these two COUs.

COUs with Modeled Multimedia Scenarios

For nine COUs, the modeled generic scenarios did not specify the apportionment of discharges across multiple media (*i.e.,* landfill, incineration, or surface water). Therefore, other lines of evidence were evaluated for each of these OESs individually to better inform the modeled surface water concentrations (Section 5.3.1). These nine COUs with multimedia releases include

- Processing – Incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production).
- Industrial use – Paints and coatings;
- Commercial use – Paints and coatings;
- Processing – As a reactant – Intermediate (plastic manufacturing);
- Manufacturing – Import;
- Processing – Repackaging – Repackaging (*e.g.,* laboratory chemicals);
- Commercial use – Laboratory chemicals – Laboratory chemicals;
- Industrial use – Adhesives and sealants – Two-component glues and adhesives; transportation equipment manufacturing; and
- Commercial use – Adhesives and sealants – Two-component glues and adhesives.

Based on existing facility release data, for one of these nine COUs—Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (*e.g.,* catalyst component for polyolefins production)—EPA had slight to moderate confidence in RQs using high-end releases without wastewater treatment and P90 flow rates. The RQ for chronic exposure to aquatic vertebrates is 2.97 and for algae 1.11 in this scenario. While EPA considered RQs based on both high-end and central tendency releases for other COUs, the RQs for this COU are based on actual measured data, greatly reducing conservatism and uncertainty. The RQs are also made less conservative by assuming high-end (90th percentile) flows, which would dilute DIBP releases leading to lower risk estimates. Therefore, EPA determined that the pre-catalyst manufacturing COU significantly contributes to unreasonable risk to the environment due to exposures to DIBP in surface water causing chronic effects on aquatic vertebrates. Given uncertainties and conservativisms, effects on algae are not the basis of the unreasonable risk determination.

For the remaining eight of nine COUs with only multimedia releases (Table 5-1), there was insufficient information to determine the fraction of the release going to each of the reported media types, including to surface water. Therefore, a sensitivity analysis was conducted (for 5 OES corresponding to 8 COUs) to determine the level of releases to surface water that would present unreasonable risk. For this analysis, RQs were calculated using 100, 75, 50, 25, 5, 1, and 0.01 percent releases to surface water. Risk estimates were evaluated with wastewater treatment removal rates of 0 percent (no wastewater treatment), 68 percent, and 90 percent. Surface water concentrations were calculated by applying the 50th, 75th, and 90th percentile (P50, P75 and P90, respectively) flow metrics from the distribution to represent a more complete range of potential flow rates. If EPA were to assume 100 percent of multimedia releases go to surface water, then risk would be indicated. Conversely, if EPA were to assume none of these releases go to surface water, then risk would not be indicated. The Agency has slight confidence in these releases because the Agency has no specific information suggesting a percentage between 0 and 100.

There are two COUs associated with application of paints and coatings in this grouping that indicate risk across scenarios starting with an assumption that only 1 percent of the total DIBP releases going to surface water, when focusing on the 7Q10, P75, and central tendency values. For example, though EPA does not have information to support a definitive percentage of release to surface water versus release to other pathways, EPA's sensitivity analysis shows RQs well above 1 (*e.g.*, central tendency RQ of 7.63) even when only 10 percent of the release is assumed to go to surface water (*i.e.*, 90% of the release is assumed to be going to landfill, incineration, etc.). As noted previously, for these COUs, water concentrations are modeled both with and without wastewater removal treatment, and because there is no direct evidence that wastewater treatment is more likely or less likely than direct release, EPA's risk determination considers both scenarios. When a 68 percent wastewater treatment efficiency is applied, risk is still indicated with RQs above 1 with 5 percent or more of the release going to surface water, using the central tendency release estimates (*e.g.*, RQs for chronic aquatic vertebrate exposure range from 1.22 to 24.41). Even when applying the high end of the range of potential wastewater treatment efficiency, 90 percent, these COUs indicate risk starting at 25 percent release to surface water, based on central tendency estimates. Despite EPA having slight confidence in the release estimates for the COUs with multimedia releases, there is overwhelming evidence to support that in most plausible scenarios resulting in releases to surface water for these two COUs, and the overall confidence in the RQs in light of the sensitivity analysis is slight to moderate. Therefore, both COUs significantly contribute to unreasonable risk of injury to the environment from chronic exposure to aquatic vertebrates:

- Industrial use – Paints and coatings; and
- Commercial use – Paints and coatings.

The supporting evidence from the sensitivity analysis for the remaining six COUs in this category shows a different pattern that does not support an unreasonable risk call. Therefore, based on the available evidence, EPA concludes that the remaining six COUs do not significantly contribute to the unreasonable risk to the environment for DIBP. EPA is making this determination because there are multiple plausible scenarios associated with the Agency's surface water assessment for these COUs that would not result in significant contributions to unreasonable risk to aquatic organisms, as described in Section 5.3.2. While there are also a few plausible scenarios associated with EPA's surface water assessment for these COUs that would result in RQs suggesting chronic risk to aquatic organisms, this is true only for the scenarios with multiple conservative assumptions. For example, no COUs have RQs less than 1 for 25 percent or less of central tendency releases assumed to go to surface water with 68 percent wastewater treatment removal (0.00–0.94). Likewise, no COUs have RQs indicating risk for 75 percent or less of central tendency releases assumed to go to surface water with 90 percent wastewater treatment removal (0.00–0.89). The six COUs are

- Processing – As a reactant – Intermediate (plastic manufacturing);
- Processing – Repackaging – Repackaging (*e.g.*, laboratory chemicals);
- Manufacturing – Importing;
- Industrial use – Adhesives and sealants – Two-component glues and adhesives; transportation equipment manufacturing;
- Commercial use – Adhesives and sealants – Two-component glues and adhesives; and
- Commercial use – Laboratory chemicals – Laboratory chemicals.

EPA has robust confidence that DIBP has chronic effects on algae, aquatic vertebrates and invertebrates in the environment due to the use of analog data. Because no aquatic chronic studies were reasonably available for the quantitative assessment of potential hazards from DIBP exposure, a read-across was conducted using DBP (U.S. EPA, 2025ak). The robust confidence in DIBP is supported by the quality and consistency of the analog DBP chronic aquatic vertebrate, invertebrate, and benthic invertebrate database. Except for the six COUs with multimedia releases (discussed above), EPA has slight to moderate confidence in the associated RQs. Further information about EPA's confidence in the aquatic, terrestrial, and trophic transfer hazard assessments is provided in Section 5.3.4 of this draft risk evaluation.

6.3 Additional Information Regarding the Basis for the Risk Determination

Table 6-1 summarizes the basis for this unreasonable risk determination of injury to human health presented in the DIBP risk evaluation for occupational uses. Table 6-2 summarizes the basis for this unreasonable risk determination of injury to the environment. In both Table 6-1 and Table 6-2, bold text and shading indicate significant contributions to unreasonable risk. Both tables identify the duration of exposure (*e.g.*, acute, intermediate, or chronic duration) and the exposure route to the population. Risk estimates across the full range of variables for the COUs with modeled multimedia scenarios are available in the *Risk Calculator for Multimedia Environmental Exposures for DIBP* (U.S. EPA, 2025ah). For this unreasonable risk determination, EPA has considered the effects of DIBP to human health, including PESS, as well as a range of risk estimates as appropriate, risk related factors, and the confidence in the analysis. See Section 4.3 for a summary of risk estimates.

Table 6-1. Supporting Basis for the Unreasonable Risk Determination for Human Health (Occupational COUs)

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Manufacturing – Domestic manufacturing	Domestic manufacturing	Manufacturing	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Manufacturing – Importing	Importing	Repackaging into large and small containers	Average Adult Worker	Central Tendency	11,400	15,545	20,005	N/A	181	246	317	178	242	312	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	18,111	N/A	197	268	345	193	263	338	N/A
Processing – Repackaging	Repackaging (*e.g.*, laboratory chemicals)			High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A
Processing – Processing as a reactant	Intermediate in plastic manufacturing	Use as a catalyst – intermediate in polypropylene manufacturing	Average Adult Worker	Central Tendency	11,398	15,543	16,641	N/A	181	246	264	178	242	260	N/A
				High-End	2,491	3,397	3,637	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,319	14,071	15,066	N/A	197	268	287	193	263	282	N/A
				High-End	2,255	3,075	3,292	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,398	15,543	16,066	N/A	1,253	1,709	1,830	1,129	1,540	1,649	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Average Adult Worker	Central Tendency	10,873	14,826	17,796	N/A	181	246	296	178	242	291	N/A
				High-End	2,171	2,961	3,170	N/A	90	123	132	87	118	127	N/A
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; Paints and coatings		Females of Reproductive Age	Central Tendency	9,843	13,423	16,111	N/A	197	268	322	193	263	315	N/A
				High-End	1,996	2,681	2,870	N/A	98	134	143	94	128	137	N/A
	Processing aids, not otherwise listed		ONU	Central Tendency	10,873	14,826	15,874	N/A	1,253	1,709	2,089	795	1,084	1,325	N/A
Processing – Incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastics converting	Average Adult Worker	Central Tendency	2,171	2,961	3,619	N/A	627	855	1,045	486	663	811	N/A
				High-End	124	169	181	N/A	313	427	458	89	121	130	N/A
			Females of Reproductive Age	Central Tendency	1,966	2,681	3,276	N/A	682	930	1,137	506	691	844	N/A
				High-End	112	153	164	N/A	341	465	498	84	115	123	N/A
			ONU	Central Tendency	2,171	2,961	3,619	N/A	1,253	1,709	2,089	795	1,084	1,325	N/A

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	**Intermed.**	**Chronic**	**APF[b]**	**Acute**	**Intermed.**	**Chronic**	**Acute**	**Intermed.**	**Chronic**	**APF[b]**
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber compounding	Average Adult Worker	Central Tendency	456	622	711	N/A	181	246	282	129	176	202	N/A
				High-End	45	61	65	N/A	90	123	132	30	41	44	N/A
			Females of Reproductive Age	Central Tendency	413	563	644	N/A	197	268	307	133	182	208	N/A
	Foam pipeline pigs			High-End	41	55	59	N/A	98	134	143	**29**	39	42	APF 5
			ONU	Central Tendency	456	622	711	N/A	1,253	1,709	1,955	334	456	522	N/A
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber converting	Average Adult Worker	Central Tendency	912	1,244	1,520	N/A	627	855	1,045	371	507	619	N/A
				High-End	48	65	69	N/A	313	427	458	41	56	60	N/A
			Females of Reproductive Age	Central Tendency	826	1,126	1,376	N/A	682	930	1,137	374	509	623	N/A
	Foam pipeline pigs			High-End	43	59	63	N/A	341	465	498	38	52	56	N/A
			ONU	Central Tendency	912	1,244	1,520	N/A	1,253	1,709	2,089	528	720	880	N/A
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings (spray application)	Average Adult Worker	Central Tendency	135	184	197	N/A	181	246	264	77	105	113	N/A
				High-End	**2.1**	**2.8**	**3.0**	APF 25	90	123	132	**2.0**	**2.8**	**2.9**	APF 25
			Females of Reproductive Age	Central Tendency	122	167	178	N/A	197	268	287	75	103	110	N/A
Commercial Use – Paints and coatings	Paints and coatings			High-End	**1.9**	**2.5**	**2.7**	APF 25	98	134	143	**1.8**	**2.5**	**2.7**	APF 25
			ONU	Central Tendency	135	184	197	N/A	361	492	527	98	134	143	N/A
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	16,644	N/A	181	246	264	178	242	260	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	15,068	N/A	197	268	287	193	263	282	N/A
Commercial Use – Paints and coatings	Paints and coatings			High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	16,644	N/A	N/A	N/A	N/A	11,400	15,545	16,644	N/A

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (spray application)	Average Adult Worker	Central Tendency	22	31	35	APF 5	181	246	284	20	27	31	APF 5
				High-End	**2.1**	**2.8**	**3.0**	APF 25	90	123	132	**2.0**	**2.8**	**2.9**	APF 25
			Females of Reproductive Age	Central Tendency	20	28	32	APF 5	197	268	309	18	25	29	APF 5
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives			High-End	**1.9**	**2.5**	**2.7**	APF 25	98	134	143	**1.8**	**2.5**	**2.7**	APF 25
			ONU	Central Tendency	**22**	31	35	APF 5	361	492	568	21	29	33	APF 5
Industrial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives – transportation equipment manufacturing	Application of adhesives and sealants (non-spray application)	Average Adult Worker	Central Tendency	11,400	15,545	17,935	N/A	181	246	284	178	242	280	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,267	N/A	197	268	309	193	263	303	N/A
Commercial Use – Adhesives and sealants	Adhesives and sealants – two-component glues and adhesives			High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	17,935	N/A	N/A	N/A	N/A	11,400	15,545	17,935	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (liquids)	Average Adult Worker	Central Tendency	11,400	15,545	17,706	N/A	181	246	280	178	242	276	N/A
				High-End	2,492	3,398	3,638	N/A	90	123	132	87	119	127	N/A
			Females of Reproductive Age	Central Tendency	10,321	14,073	16,030	N/A	197	268	305	193	263	300	N/A
				High-End	2,256	3,076	3,294	N/A	98	134	143	94	128	137	N/A
			ONU	Central Tendency	11,400	15,545	17,706	N/A	N/A	N/A	N/A	11,400	15,545	17,706	N/A
Commercial Use – Laboratory chemicals	Laboratory chemicals	Use of laboratory chemicals (solids)	Average Adult Worker	Central Tendency	240,000	327,27	372,766	N/A	627	855	973	625	852	971	N/A
				High-End	16,889	23,030	24,658	N/A	313	427	458	308	420	449	N/A
			Females of Reproductive Age	Central Tendency	217,275	296,284	337,470	N/A	682	930	1,059	680	927	1,056	N/A
				High-End	15,290	20,850	22,323	N/A	341	465	498	334	455	487	N/A
			ONU	Central Tendency	240,000	327,273	372,766	N/A	1,253	1,709	1,947	1,247	1,700	1,937	N/A

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]
Processing – Recycling	Recycling	Recycling	Average Adult Worker	Central Tendency	877	1,196	1,435	N/A	627	855	1,026	366	498	598	N/A
				High-End	63	87	93	N/A	313	427	458	53	72	77	N/A
			Females of Reproductive Age	Central Tendency	794	1,083	1,299	N/A	682	930	1,116	367	500	601	N/A
				High-End	57	78	84	N/A	341	465	498	49	67	72	N/A
			ONU	Central Tendency	877	1,196	1,435	N/A	1,253	1,709	2,052	516	704	844	N/A
Disposal – Disposal	Disposal	Waste handling, treatment, and disposal	Average Adult Worker	Central Tendency	877	1,196	1,435	N/A	627	855	1,026	366	498	598	N/A
				High-End	63	87	93	N/A	313	427	458	53	72	77	N/A
			Females of Reproductive Age	Central Tendency	794	1,083	1,299	N/A	682	930	1,116	367	500	601	N/A
				High-End	57	78	84	N/A	341	465	498	49	67	72	N/A
			ONU	Central Tendency	877	1,196	1,435	N/A	1,253	1,709	2,052	516	704	844	N/A
Industrial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Fabrication or use of final products and articles	Average Adult Worker	Central Tendency	1,140	1,555	1,664	N/A	627	855	915	404	551	590	N/A
				High-End	127	173	185	N/A	313	427	458	90	123	132	N/A
Commercial Use – Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)		Females of Reproductive Age	Central Tendency	1,032	1,407	1,507	N/A	682	930	996	411	560	600	N/A
				High-End	115	156	167	N/A	341	465	498	86	117	125	N/A
Commercial Use – Toys, playground, and sporting equipment	Toys, playground, and sporting equipment		ONU	Central Tendency	1,140	1,555	1,664	N/A	1,253	1,709	1,830	597	814	872	N/A

Life Cycle Stage –Category	Subcategory	OES	Population[a]	Exposure Level	Inhalation Risk Estimates (Benchmark MOE = 30)				Dermal Risk Estimates (Benchmark MOE = 30)			Aggregate Risk Estimates (Benchmark MOE = 30)			
					Acute	Intermed.	Chronic	APF[b]	Acute	Intermed.	Chronic	Acute	Intermed.	Chronic	APF[b]

[a] In absence of ONU inhalation exposure data, EPA used worker central tendency exposure estimates as surrogate data for ONU inhalation exposure. Dermal exposures to ONUs are represented by incidental skin contact equal to the surface area of one palm.
[b] This value is the protection factor of PPE required to raise the acute MOE above the benchmark of 30. The Assigned Protection Factors (APF) associated with different types of respirators based on function (air-purifying, powered air purifying, supplied air) and fit (quarter mask, half-mask, full-face piece, helmet/hood, loose-fitting facepiece) are presented above. It should be noted that certain respirators are only applicable to specific types of inhalation exposure. See the OSHA Small Entity Compliance Guide for the Respiratory Protection Standard for detailed descriptions on the respirators corresponding to the APFs in the table.
ONU = occupational non-users, CT = central tendency; HE = high-end; MOE = margin of exposure, PF = protection factor, APF = assigned protection factor, Pop = Population, Expos = Exposure, Repro = Reproductive, Inter = Intermediate
Benchmark MOE = 30. Bold/shaded text indicates an MOE that is below the benchmark value of 30 and is significantly contributing to unreasonable risk.

Table 6-2. Supporting Basis for the Unreasonable Risk Determination for the Environment

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	Subcategory						Acute	Chronic Invertebrate	Algae	Chronic Vertebrate
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – plastic product manufacturing	Plastic compounding	Central tendency	P50	0	82.2	0.29	6.72	19.6	52.7
					68	26.3	0.09	2.15	6.28	16.9
	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings			P75	0	18.3	0.06	**1.49**	**4.37**	**11.73**
					68	5.86	0.02	0.48	**1.40**	**3.75**
				P90	0	0.29	0.00	0.02	0.07	0.19
					68	0.09	0.00	0.01	0.02	0.06
			High-end	P50	0	405	1.41	33.1	96.7	260
					68	130	0.45	10.6	30.9	83.1
	Processing aids, not otherwise listed			P75	0	90.2	0.31	7.38	21.5	57.8
					68	28.9	0.10	2.36	6.89	18.5
				P90	0	1.43	0.00	0.12	0.34	0.92
					68	0.46	0.00	0.04	0.11	0.29
Processing – Processing – incorporation into article	Plasticizers in: – plastic product manufacturing; transportation equipment manufacturing	Plastic converting	Central tendency	P50	0	7.73	0.03	0.63	1.84	4.96
					68	2.47	0.01	0.20	0.59	1.59
				P75	0	6.43	0.02	0.53	**1.53**	**4.12**
					68	2.06	0.01	0.17	0.49	**1.32**
				P90	0	1.61	0.01	0.13	0.38	1.03
					68	0.52	0.00	0.04	0.12	0.33
			High-end	P50	0	33.50	0.12	2.74	8.00	21.47
					68	10.7	0.04	0.88	2.56	6.87
				P75	0	27.90	0.10	2.28	6.66	17.9
					68	8.93	0.03	0.73	2.13	5.72
				P90	0	6.96	0.02	0.57	1.66	4.46
					68	2.23	0.01	0.18	0.53	1.43

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	Subcategory						Acute	Chronic Invertebrate	Algae	Chronic Vertebrate
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plasticizers in: – adhesive manufacturing	Incorporation into adhesives and sealants	Central tendency	P50	68	13.6	0.05	1.11	3.24	8.70
				P75	68	1.23	0.00	0.10	0.29	0.79
				P90	68	0.32	0.00	0.03	0.08	0.21
			High-end[g]	P50	68	13.7	0.05	1.12	3.28	8.80
				P75	68	1.24	0.00	0.10	0.30	0.80
				P90	68	0.33	0.00	0.03	0.08	0.21
Processing – Processing – incorporation into formulation, mixture, or reaction product	Solvents (which become part of product formulations or mixture) – plastic material and resin manufacturing; paints and coatings	Incorporation into paints and coatings	Central tendency	P50	68	12.6	0.04	1.03	3.01	8.08
				P75	68	3.36	0.01	0.27	0.80	**2.15**
				P90	68	0.07	0.00	0.01	0.02	0.05
			High-end	P50	68	25	0.09	2.05	5.97	16.04
				P75	68	6.69	0.02	0.55	1.60	4.29
				P90	68	0.15	0.00	0.01	0.04	0.09
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – compounding	Central tendency	P50	0	2.03	0.01	0.17	0.48	1.30
					68	0.65	0.00	0.05	0.16	0.42
				P75	0	1.60	0.01	0.13	0.38	1.03
					68	0.51	0.00	0.04	0.12	0.33
				P90	0	0.30	0.00	0.02	0.07	0.19
					68	0.10	0.00	0.01	0.02	0.06
			High-end	P50	0	2.71	0.01	0.22	0.65	1.74
					68	0.87	0.00	0.07	0.21	0.56
				P75	0	2.13	0.01	0.17	0.51	1.37
					68	0.68	0.00	0.06	0.16	0.44
				P90	0	0.40	0.00	0.03	0.10	0.26
					68	0.13	0.00	0.01	0.03	0.08

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	**Subcategory**						**Acute**	**Chronic Invertebrate**	**Algae**	**Chronic Vertebrate**
Processing – Processing – incorporation into formulation, mixture, or reaction product	Plastic and rubber products not covered elsewhere	Rubber manufacturing – converting	Central tendency	P50	0	2.17	0.01	0.96	0.52	1.39
					68	0.69	0.00	0.06	0.17	0.45
				P75	0	1.71	0.01	0.14	0.41	1.10
					68	0.55	0.00	0.04	0.13	0.35
				P90	0	0.32	0.00	0.03	0.08	0.21
					68	0.10	0.00	0.01	0.02	0.07
			High-end	P50	0	2.93	0.01	0.24	0.70	1.88
					68	0.94	0.00	0.08	0.22	0.60
				P75	0	2.31	0.01	0.19	0.55	1.48
					68	0.74	0.00	0.06	0.18	0.47
				P90	0	0.43	0.00	0.04	0.10	0.28
					68	0.14	0.00	0.01	0.03	0.09
Processing – Processing – incorporation into formulation, mixture, or reaction product	Pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)	Use as a catalyst – formulation into pre-catalyst[f]	Multiple Scenarios[e]	Multiple Scenarios[e]			**RQs range from 1.11–2.97**			
Industrial Use – Paints and coatings	Paints and coatings	Application of paints and coatings	Multiple Scenarios[e]	Multiple Scenarios[e]			**RQs range from 1.22–24.41**			
Commercial Use – Paints and coatings										

COU		OES	Surface Water Release[a]	Flow	WWT[b] (%)	SWC (µg/L)	Risk Quotient (RQ)[c]			
Life Cycle Stage – Category	Subcategory						Acute	Chronic Invertebrate	Algae	Chronic Vertebrate
COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario (basis of release estimate); SWC = surface water concentration; RQ = risk quotient; WWT = wastewater treatment Bolded and shaded values indicate RQ> 1 that informed the unreasonable risk determination. [a] Central tendency and high-end represent the median and 95th percentile of environmental release, respectively. [b] Percentage of DIBP removed with wastewater treatment (WWT) was determined from (U.S. EPA, 1982). Zero value indicates no WWT, or direct to surface water, which was only applied to the COUs in which direct to surface water was indicated as a potential media of release (Table 3-6). [c] Concentrations of concern (COC) are 1.56 µg/L for chronic vertebrate, 12.26 µg/L for chronic invertebrate, and 4.19 µg/L for algae. [d] Single RQ> 1 for acute (COC of 287 µg/L) high-end P50 flow. [e] For these COUs (at the end of the table), the evaluation used modeled scenarios which did not specify the apportionment of discharges to water versus other media types (i.e., landfill, incineration). See Section 5.3.2 for the discussion and the *Risk Calculator for Multimedia Environmental Exposures for DIBP* (U.S. EPA, 2025ah) for the full range of RQ values which informed the unreasonable risk determination. [f] Based on existing facility release data, for Processing – incorporation into formulation, mixture, or reaction product – pre-catalyst manufacturing (e.g., catalyst component for polyolefins production) EPA's risk determination uses high-end releases without wastewater treatment and P90 flow rates. The RQ for chronic exposure to aquatic vertebrates is 2.97 and for algae 1.11 in this scenario.										

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APPENDICES

Appendix A KEY ABBREVIATIONS AND ACRONYMS

ADD	Average daily dose
ADC	Average daily concentration
AGD	Anogenital distance
APF	Assigned protection factor
BBP	Butyl benzyl phthalate
BLS	Bureau of Labor Statistics (U.S.)
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential business information
CDC	Centers for Disease Control and Prevention (U.S.)
CDR	Chemical Data Reporting
CEHD	Chemical Exposure Health Data
CEM	Consumer Exposure Model
CFR	Code of Federal Regulations
COC	Concentration of concern
CPSC	Consumer Product Safety Commission (U.S.)
CRA	Cumulative risk assessment
DBP	Dibutyl phthalate
DCHP	Dicyclohexyl phthalate
DEHP	Diethylhexyl phthalate
DIBP	Diisobutyl phthalate
DIDP	Diisodecyl phthalate
DINP	Diisononyl phthalate
DIY	Do-it-yourself
EPA	Environmental Protection Agency (U.S.)
ESD	Emission scenario document
EU	European Union
FDA	Food and Drug Administration (U.S.)
GS	Generic scenario
K_{OC}	Soil organic carbon: water partitioning coefficient
K_{OW}	Octanol: water partition coefficient
HEC	Human equivalent concentration
HED	Human equivalent dose
IMDS	International Material Data System
IADD	Intermediate average daily dose
IR	Ingestion rate
LCD	Life cycle diagram
LOAEL	Lowest-observed-adverse-effect level
Log K_{OC}	Logarithmic organic carbon: water partition coefficient
Log K_{OW}	Logarithmic octanol: water partition coefficient
MOA	Mode of action
MOE	Margin of exposure
NAICS	North American Industry Classification System
NHANES	National Health and Nutrition Examination Survey
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NOAEL	No-observed-adverse-effect level

NPDES	National Pollutant Discharge Elimination System
OCSPP	Office of Chemical Safety and Pollution Prevention (EPA)
OECD	Organisation for Economic Co-operation and Development
OES	Occupational exposure scenario
OEV	Occupational exposure value
ONU	Occupational non-user
OPPT	Office of Pollution Prevention and Toxics (EPA)
OSHA	Occupational Safety and Health Administration (U.S.)
PBZ	Personal breathing zone
PESS	Potentially exposed or susceptible subpopulations
PND	Postnatal day
PNOR	Particulates not otherwise regulated (model)
POD	Point of departure
PPE	Personal protective equipment
PV	Production volume
PVC	Polyvinyl chloride
RPF	Relative potency factor
RQ	Risk quotient
SACC	Science Advisory Committee on Chemicals
SDS	Safety data sheet
SOC	Standard occupational classification
SpERC	Specific emission release category
TRI	Toxic Release Inventory
TRV	Toxicity reference value
TSCA	Toxic Substances Control Act
TSD	Technical support document
TWA	Time-weighted average
UF	Uncertainty factor
U.S.	United States
VVWM-PSC	Variable Volume Water Model with Point Source Calculator tool
w/w	Wet weight
WWTP	Wastewater treatment plant
7Q10	Lowest 7-day average flow that occurs (on average) once every 10 years
30Q5	Lowest 30-day average flow that occurs (on average) once every 5 years

Appendix B REGULATORY AND ASSESSMENT HISTORY

B.1 Federal Laws and Regulations

Table_Apx B-1. Federal Laws and Regulations

Statutes/Regulations		
EPA statutes/regulations		
Toxic Substances Control Act (TSCA) – section 6(b)	EPA is directed to identify high-priority chemical substances for risk evaluation; and conduct risk evaluations on at least 20 high priority substances no later than three and one-half years after the date of enactment of the Frank R. Lautenberg Chemical Safety for the 21st Century Act.	Diisobutyl phthalate is one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924, December 30, 2019). Designation of diisobutyl phthalate as high-priority substance constitutes the initiation of the risk evaluation on the chemical substance.
TSCA – section 8(a)	The TSCA section 8(a) CDR rule requires manufacturers (including importers) to give EPA basic exposure-related information on the types, quantities and uses of chemical substances produced domestically and imported into the United States.	Di-isobutyl phthalate manufacturing (including importing), processing and use information is reported under the CDR rule (76 FR 50816, August 16, 2011).
TSCA – section 8(b)	EPA must compile, keep current and publish a list (the TSCA Inventory) of each chemical substance manufactured (including imported) or processed in the United States.	Diisobutyl phthalate was on the initial TSCA Inventory and therefore was not subject to EPA's new chemicals review process under TSCA section 5 (60 FR 16309, March 29, 1995).
TSCA – section 8(d)	Provides EPA with authority to issue rules requiring producers, importers, and (if specified) processors of a chemical substance or mixture to submit lists and/or copies of ongoing and completed, unpublished health and safety studies.	Zero health and safety studies received for di-isobutyl phthalate (1982–1992) (U.S. EPA, ChemView. Accessed April 25, 2019). Di-isobutyl phthalate is listed under the category "Alkyl phthalates — all alkyl esters of 1,2-benzenedicarboxylic acid (ortho -phthalic acid)" (40 CFR 716.120).
TSCA – section 8(e)	Manufacturers (including importers), processors, and distributors must immediately notify EPA if they obtain information that supports the conclusion that a chemical substance or mixture presents a substantial risk of injury to health or the environment.	Two risk reports received for di-isobutyl phthalate (2003: 88030000106; 2010: 88100000438**)** (U.S. EPA, ChemView; accessed December 29, 2025).

Statutes/Regulations		
Clean Water Act (CWA) – sections 301, 304, 306, 307, and 402		
Other federal statutes/regulations		
Federal Food, Drug, and Cosmetic Act (FFDCA)	Provides the FDA with authority to oversee the safety of food, drugs and cosmetics.	Di-isobutyl phthalate is listed as an optional substance to be used in: adhesives to be used as components of articles intended for use in packaging, transporting, or holding food (21 CFR 175.105); the base sheet and coating of cellophane (21 CFR 177.1200).
Consumer Product Safety Improvement Act of 2008 (CPSIA)	Under section 108 of CPSIA, CPSC prohibits the manufacture for sale, offer for sale, distribution in commerce or importation of eight phthalates in toys and childcare articles at concentrations >0.1%: di-ethylhexyl phthalate, dibutyl phthalate, butyl benzyl phthalate, diisononyl phthalate, diisobutyl phthalate, di-n-pentyl phthalate, di-n-hexyl phthalate and dicyclohexyl phthalate.	The use of di-isobutyl phthalate at concentrations >0.1% is banned in toys and child care articles (16 CFR part 1307.3). Di-isobutyl phthalate is considered "toxic" under the FHSA. (CPSC Toxicity Review of di-isobutyl phthalate, Oct. 24, 2010). See also CPSC, Exposure Assessment: Potential for the Presence of Phthalates in Selected Plastics, October 1, 2015 (accessed December 29, 2025).

B.2 State Laws and Regulations

Table_Apx B-2. State Laws and Regulations

State Actions	Description of Action
State Water Pollution Discharge Programs	Several states have adopted water pollution discharge programs that categorize di-isobutyl phthalate as an "aromatic organic chemical," as applicable to the process wastewater discharges resulting from the manufacture of bulk organic chemicals, including Illinois (35 Ill. Adm. Code 307-2406; accessed December 29, 2025); and Wisconsin (Wis. Adm. Code § NR 235.60; accessed December 29, 2025).
Chemicals of High Concern to Children	Several states have adopted reporting laws for chemicals in children's products containing diisobutyl phthalate, including: Minnesota, which lists di-isobutyl phthalate as a "chemical of high concern" (Toxic Free Kids Act Minn. Stat. 116.9401 to 116.9407; accessed December 29, 2025); and Washington State, which lists di-isobutyl phthalate as a "chemical of high concern to children" (Wash. Admin. Code 173-334-130; accessed December 29, 2025).
Other	Di-isobutyl phthalate is listed as a Candidate Chemical under California's Safer Consumer Products Program established under Health and Safety Code § 25252 and 25253 (California, Candidate Chemicals List (accessed December 29, 2025). Di-isobutyl phthalate is listed as a "nonfunctional constituent" under California's Cleaning Product Right to Know Act of 2017 (California Health & Safety Code § 108952; accessed December 29, 2025).

State Actions	Description of Action
	California lists di-isobutyl phthalate as a designated priority chemical for biomonitoring (accessed December 29, 2025) under criteria established by California SB 1379 (Biomonitoring California, Priority Chemicals, February 2019).

B.3 International Laws and Regulations

Table_Apx B-3. International Laws and Regulations

Country/Tribe/ Organization	Requirements and Restrictions
Canada	Di-isobutyl phthalate is on the Domestic Substances List (Government of Canada. Managing substances in the environment. Substances search. Database accessed December 29, 2025).
European Union	In February 2012, di-isobutyl phthalate was added to Annex XIV of REACH (Authorisation List) with a sunset date of February 21, 2015. After the sunset date, only persons with approved authorization applications may continue to use the chemical. No requests for authorization were submitted by any user. There is a recommendation for amending the authorization list under review, with a deadline for commenting on December 3, 2019, which would revise the allowable concentration of the chemical for use in mixtures from 0.3–0.1% (European Chemicals Agency (ECHA) database (accessed December 29, 2025). In March 2015, di-isobutyl phthalate was added to Annex II of Directive 2011/65/EU (accessed December 29, 2025) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) (RoHS 2). The Directive sets a maximum concentration value tolerated by weight in homogenous materials for di-isobutyl phthalate of 0.1%. The restriction applies to medical devices, including *in vitro* medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021. The restriction does not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including *in vitro* medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021 (Commission Delegated Directive (EU) 2015/863; accessed December 29, 2025). Di-isobutyl phthalate is subject to the Restriction of Hazardous Substances Directive (RoHS), EU/2015/863 (accessed December 29, 2025), which restricts the use of hazardous substances at more than 0.1% by weight at the "homogeneous material" level in electrical and electronic equipment, beginning July 22, 2019. (European Commission RoHS).
Australia	Di-isobutyl phthalate was assessed under Human Health Tier II of the Inventory Multi-Tiered Assessment and Prioritisation (IMAP) as part of the C4-6 side chain transitional phthalates. Uses reported include as a plasticizer for rubber and PVC, and in adhesives (NICNAS, 2016, *Human Health Tier II assessment for* C4-6 side chain transitional phthalates; accessed December 29, 2025). In addition, di-isobutyl phthalate was assessed under Environment Tier II of IMAP as part of the phthalate esters.
Japan	Di-isobutyl phthalate is regulated in Japan under the following legislation: • Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (Chemical Substances Control Law; CSCL)

Country/Tribe/ Organization	Requirements and Restrictions
	(National Institute of Technology and Evaluation (NITE) Chemical Risk Information Platform (CHRIP); accessed December 29, 2025).
World Health Organization (WHO)	WHO International Programme on Chemical Safety identified an acute hazard for di-isobutyl phthalate as combustible and recommended prevention and fire-fighting techniques (ICSC: 0829, October 2006).
Denmark, Ireland, Latvia, New Zealand, South Africa, United Kingdom	Occupational exposure limits for diisobutyl phthalate (GESTIS International limit values for chemical agents) database (https://ilv.ifa.dguv.de/limitvalues/21276; accessed December 29, 2025). Ireland, New Zealand, South Africa (mining), and the United Kingdom have an 8-hour limit of 5 mg/m^3. Latvia has an 8-hour limit of 1 mg/m^3. Denmark has an 8-hour limit of 3 mg/m^3.

B.4 Assessment History

Table_Apx B-4. Assessment History of DIBP

Authoring Organization	Publication
Other U.S.-based organizations	
U.S. Consumer Product Safety Commission (U.S. CPSC)	*Chronic Hazard Panel on Phthalates and Phthalate Alternatives Final Report (With Appendices)* (CPSC, 2014) *Toxicity Review of Diisobuty Phthalate (DIBP)* (CPSC, 2011)
International	
European Union, European Chemicals Agency (ECHA)	*Annex to the Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP)* (ECHA, 2017a) Opinion on an Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP) (ECHA, 2017b) Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates (ECHA, 2012a) Committee for Risk Assessment (RAC) Opinion on an Annex XV dossier proposing restrictions on four phthalates (ECHA, 2012b)
Government of Canada, Environment Canada, Health Canada	*Screening Assessment: Phthalate Substance Grouping* (Health Canada, 2020) *State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8;16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6* (EC/HC, 2015)

Authoring Organization	Publication
National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Australian Government	*C4-6 side chain transitional phthalates: Human health tier II assessment* (NICNAS, 2016) *Existing chemical hazard assessment report: Diisobutyl phthalate* (NICNAS, 2008a) *Phthalates hazard compendium: A summary of physicochemical and human health hazard data for 24 ortho-phthalate chemicals* (NICNAS, 2008b)

Appendix C LIST OF TECHNICAL SUPPORT DOCUMENTS AND SUPPLEMENTAL FILES

The below list indicates all technical support documents (TSDs) and supplemental files associated with this risk evaluation. These include discipline-specific assessments, systematic review results, risk calculations, modeling outputs, and public communication documents (see EPA-HQ-OPPT-2018-0434).

Associated **Systematic Review Protocol and Data Quality Evaluation and Data Extraction** Documents – Provide additional detail and information on systematic review methodologies used as well as the data quality evaluations and extractions criteria and results for DIBP.

Systematic Review Protocol for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025ao) – In lieu of an update to the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances*, also referred to as the "2021 Draft Systematic Review Protocol" (U.S. EPA, 2021b), this systematic review protocol for the risk evaluation for DIBP describes some clarifications and different approaches that were implemented than those described in the 2021 Draft Systematic Review Protocol in response to (1) SACC comments, (2) public comments, or (3) to reflect chemical-specific risk evaluation needs. This supplemental file may also be referred to as the "DIBP Systematic Review Protocol."

Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025m) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of physical and chemical properties. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties."

Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025k) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation for Environmental Fate and Transport. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport."

Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025l) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of environmental release and occupational exposure. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure."

Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025o) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure."

Data Extraction Information for General Population, Consumer, and Environmental Exposure for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025i) – Provides a compilation of tables for the data extraction for DIBP. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation of general population, consumer, and environmental exposure. This supplemental file may also be referred to as the "DIBP Data Extraction Information for General Population, Consumer, and Environmental Exposure."

Data Quality Evaluation Information for Human Health Hazard Epidemiology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025q) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of epidemiological information. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation Information for Human Health Hazard Epidemiology."

Data Quality Evaluation Information for Human Health Hazard Animal Toxicology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025p) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of human health hazard animal toxicity information. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation Information for Human Health Hazard Animal Toxicology."

Data Quality Evaluation Information for Environmental Hazard for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025n) – Provides a compilation of tables for the data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was evaluated from a data source that has information relevant for the evaluation of environmental hazard toxicity information. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation Information for Environmental Hazard."

Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025h) – Provides a compilation of tables for the data extraction for DIBP. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation of environmental hazard and human health hazard animal toxicology and epidemiology information. This supplemental file may also be referred to as the "DIBP Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology."

Data Quality Evaluation and Data Extraction Information for Dermal Absorption for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025j) – Provides a compilation of tables for the data extraction and data quality evaluation information for DIBP. Each table shows the data point, set, or information element that was extracted and evaluated from a data source that has information relevant for the evaluation of dermal absorption properties. This supplemental file may also be referred to as the "DIBP Data Quality Evaluation and Data Extraction Information for Dermal Absorption."

Associated **Technical Support Documents (TSDs)** – Provide additional details and information on exposure, hazard, and risk assessments for DIBP.

Physical Chemistry and Fate and Transport Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025ag)

Environmental Release and Occupational Exposure Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025w)

Consumer and Indoor Exposure Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025e)

Environmental Media and General Population and Environmental Exposure Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025v)

Environmental Hazard Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025t)

Non-Cancer Human Health Hazard Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025ad)

Cancer Human Health Hazard Assessment for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP) (U.S. EPA, 2025b)

Consumer Risk Calculator for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025g)

Consumer Exposure Analysis for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025f)

Risk Calculator for Occupational Exposures for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025aj)

Fish Ingestion Risk Calculator for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025x)

Surface Water Human Exposure Risk Calculator for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025an)

Ambient Air Exposure Assessment for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025a)

Occupational and Consumer Cumulative Risk Calculator for Diisobutyl Phthalate (DIBP) (U.S. EPA, 2025af)

Meta-Analysis and Benchmark Dose Modeling of Fetal Testicular Testosterone for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), and Dicyclohexyl Phthalate (DCHP) (U.S. EPA, 2025y).

Technical Support Document for the Cumulative Risk Analysis of Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), Butyl Benzyl Phthalate (BBP), Diisobutyl Phthalate (DIBP), Dicyclohexyl Phthalate (DCHP), and Diisononyl Phthalate (DINP) Under the Toxic Substances Control Act (TSCA) (U.S. EPA, 2025ap).

Summary of Facility Release Data for Di(2-ethylhexyl) Phthalate (DEHP), Dibutyl Phthalate (DBP), and Butyl Benzyl Phthalate (BBP) (U.S. EPA, 2025am).

*Risk Calculator for Multimedia Environmental Exposures for Diisobutyl Phthalate (DIBP) (*U.S. EPA, 2025ah*).*

Appendix D UPDATES TO THE DIBP CONDITIONS OF USE TABLE

Following the release of the final scope (U.S. EPA, 2020c), EPA received submissions under the 2020 CDR reported data (U.S. EPA, 2020a). In addition, the reporting name codes changed for the 2020 CDR reporting cycle. The Agency amended the description of certain DIBP COUs and removing COUs that are no longer ongoing based on those new submissions and new reporting name codes as well as based on information EPA received from stakeholders about uses of DIBP. Table_Apx D-1 summarizes the changes to the COUs based on the new reporting codes in the 2020 CDR and any other new information since the publication of the final scope document (U.S. EPA, 2020c).

Table_Apx D-1. Additions and Name Changes to Categories and Subcategories of COUs Based on CDR Reporting and Stakeholder Engagement

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2025 Risk Evaluation
Processing, Incorporation into articles	Plasticizers; construction	Although this was reported in the 2016 CDR cycle, it was not reported in the 2020 CDR cycle and there are no downstream uses of DIBP in construction to suggest this processing use is occurring (U.S. EPA, 2020a, 2019a).	N/A
Processing, incorporation into formulation, mixture, or reaction product	Fuels and related products (*e.g.*, fuel additives)	Removed because DIBP is not used as a fuel stabilizer. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, incorporation into formulation, mixture, or reaction product	Inks, toner, and colorant products (*e.g.*, toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, incorporation into formulation, mixture, or reaction product	Repackaging (*e.g.*, laboratory chemicals	Consolidating this category and subcategory under “Processing – repackaging.”	Processing – Repackaging (*e.g.*, laboratory chemicals)
Processing, incorporation into formulation, mixture, or reaction product	Fabric, textile, and leather products not covered elsewhere	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Processing, incorporation into formulation,	N/A	Added category and subcategory in response to information provided by the company (W.R. Grace & Company, 2024a, 2022).	Processing – Processing, incorporation into formulation, mixture,

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2025 Risk Evaluation
mixture, or reaction product			or reaction product – pre-catalyst manufacturing (*e.g.*, catalyst component for polyolefins production)
Processing, incorporation into formulation, mixture, or reaction product	N/A	Added category and subcategory in response to information provided by manufacturer of DIBP. (LANXESS, 2021a)	Foam in pipeline pigs
Processing, as a reactant	N/A	Added category and subcategory in response to information provided by the company as it relates to their customers (W.R. Grace & Company, 2024a).	Processing – Processing as a reactant – intermediate (plastic manufacturing)
Industrial Use	Fuels and related products	Removed because DIBP is not used as a fuel stabilizer. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
Industrial Use	Fabric, textile, and leather products not covered elsewhere (*e.g.*, textile [fabric] dyes)	Removed because this is not a use of DIBP.	N/A
Industrial Use	Inks, toner, and colorant products (*e.g.*, toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Building/construction materials not covered elsewhere	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Industrial Use	Floor coverings	Removed because this is not a use of DIBP.	N/A

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2025 Risk Evaluation
Commercial Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
Commercial Use	Inks, toner, and colorant products (*e.g.*, toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Commercial Use	Air care products (*e.g.*, air freshener)	Removed because this is not a use of DIBP.	N/A
Commercial Use	N/A	Added category and subcategory based on information of DIBP in turf and tire crumb installation.	Toys, playground, and sporting equipment
Consumer Use	Inks, toner, and colorant products (*e.g.*, toner/printer cartridge)	Removed because this is not a use of DIBP. The subcategory was not reported in the 2016 or 2020 CDR cycle, and EPA does not have more recent information to support this use (U.S. EPA, 2020a, 2019a).	N/A
Consumer Use	Air care products (*e.g.*, air freshener)	Removed because this is not a use of DIBP.	N/A
Consumer Use	Plastic and rubber products not covered elsewhere	Updated subcategory to better reflect 2020 CDR reporting codes (U.S. EPA, 2020a).	Other articles with routine direct contact during normal use including rubber articles; plastic articles (hard)
Consumer Use	Consumer articles that contain di-isobutyl phthalate from: – Inks, toner and – Paints and coatings – Adhesives and sealants (*e.g.*, paper products)	This is either not a current use of DIBP or consolidated into another COU to avoid duplication.	Consumer Use – Paints and coatings And Consumer Use – Adhesives and sealants

As indicated in Table_Apx D-1, the changes are based on close examination of the CDR reports, including the 2020 CDR reports that were received after the scope was completed, additional research on the COUs, additional comments from stakeholders, and overall systematic review of the use information.

When developing this risk evaluation, EPA concluded that there were some instances where subcategory information on the processing and uses of DIBP was misreported by CDR reporters based on outreach with stakeholders and the use was no longer ongoing. Therefore, as described in Table_Apx D-1, EPA has made changes to COUs for the risk evaluation.

In addition, EPA did further analysis of the following COUs, which resulted in the changes already presented in the table that warrant further explanation because these COUs were changed significantly between the final scope and the risk evaluation:

- *"Processing, processing as a reactant – Plasticizer; plastics product manufacturing"* One company reported this use in the 2020 CDR cycle (U.S. EPA, 2020a). It is EPA's understanding that this COU is better captured under "processing, incorporation into articles" and "processing, incorporation into formulation, mixture, or reaction product" as DIBP is not used as a reactant. The use as a plasticizer is more appropriately captured under other processing COUs (U.S. EPA, 2020d).
- *"Consumer use and commercial use – Toys, playground, and sporting equipment*" This COU was included in the final DIBP scope COU table under the consumer life cycle due to comments received, including one containing a technical report that highlighted DIBP found in toy products in Europe and in toys and exercise equipment in Canada (U.S. EPA, 2020c). EPA notes in the final scope that the U.S. CPSC has banned the use of DIBP at concentrations of greater than 0.1 percent in children's toys and childcare articles. EPA expects that the use of DIBP in toys manufactured or processed prior to the ban may still be occurring. The Agency has further included this COU due to use of DIBP in a component of tire crumb at the commercial life-cycle stage. This use category was added to the commercial section to cover installation of artificial turfs including tire crumb.

Appendix E CONDITIONS OF USE DESCRIPTIONS

The following descriptions are intended to include examples of uses so as not to exclude other activities that may also be included in the COUs of the chemical substance. To better describe the COU, EPA considered CDR submissions from previous CDR cycles for DIBP (CASRN 84-69-5), and the COU descriptions reflect what EPA identified as the best fit for those submissions. Examples of articles, products, or activities are included in the following descriptions to help describe the COU but are not exhaustive. EPA uses the terms "articles" and "products" or product mixtures in the following descriptions and is generally referring to articles and products as defined by 40 CFR part 751.

E.1 Manufacturing – Domestic Manufacturing

Domestic manufacturing means to manufacture or produce DIBP within the United States. This includes the extraction of DIBP from a previously existing chemical substance or complex combination of chemical substances and loading and repackaging (but not transport) associated with the manufacturing and production of DIBP.

At a typical manufacturing site, DIBP is formed in a closed system by catalytically esterifying phthalic anhydride with n-butyl alcohols (isobutanol). As with other phthalates, the unreacted alcohols are recovered and reused, and the DIBP mixture is purified by vacuum distillation or activated charcoal. The purity of DIBP can achieve 99 percent or greater using current manufacturing processes. The remaining fraction of DIBP may contain a maximum of 0.1 percent water. DIBP functions primarily as a plasticizer in a variety of industries and products. It is a phthalate ester and diester derived from isobutanol, and is used as a plasticizer, hardening agent, curing agent and crosslinker. It is primarily found in adhesives and sealants (U.S. EPA, 2017b; Kim et al., 2016). DIPB is used as a plasticizer and in mixture formulations in a variety of industrial settings. Specifically, DIBP is used in adhesive manufacturing, chemical manufacturing, coatings, construction, glue manufacturing, plasticizers, plastics product manufacturing, and transportation equipment manufacturing.

Examples of CDR Submissions

In 2016, one CDR company reported domestic manufacturing of DIBP, with the manufacturer producing a liquid (U.S. EPA, 2019a). In 2020, one CDR company reported domestic manufacturing of DIBP, with the manufacturer producing a liquid (U.S. EPA, 2020a).

E.2 Manufacturing – Importing

Import refers to the import of DIBP into the customs territory of the United States. This COU includes unloading and loading storage tanks or other containers as well as repackaging (but not transport) associated with the import of DIBP. In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments. These shipments take the form of oceangoing chemical tankers, railcars, tank trucks, and intermodal tank containers (U.S. EPA, 2020c).

Examples of CDR Submissions

In 2016, one CDR company reported importation of DIBP, with the company importing DIBP as a solid (U.S. EPA, 2019a). Although the importer did not report import in the 2020 CDR, importation of DIBP could occur (U.S. EPA, 2020a).

E.3 Processing – Incorporation into Article – Plasticizers (Plastic Product Manufacturing; Transportation Equipment Manufacturing)

This COU refers to the preparation of an article; that is, the incorporation of DIBP into articles, meaning DIBP becomes a component of the article, after its manufacture, for distribution in commerce. In this case, DIBP is present in a raw material such as plastic and transportation equipment manufacturing that contains a mixture of plasticizers and other additives, and this COU refers to the manufacturing of plastic articles and transportation equipment using those raw materials.

Earthjustice commented that DIBP is used mainly as a plasticizer (making plastics flexible) and a gelling aid in plastics production (EPA-HQ-OPPT-2018-0434-0014). The Alliance of Automobile Manufacturers and Motor & Equipment Manufacturers Association (MEMA) commented that DIBP is used in automobile manufacturing (EPA-HQ-OPPT-2019-0131-0022). In its internal data collection, MEMA identified DIBP in 37 parts. In total, in the International Material Data System (IMDS), DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. The average scope of the relative mass of DIBP in the parts from the Alliance's data collection is 1.62 grams (EPA-HQ-OPPT-2019-0131-0022).

The Aerospace Industries Association (AIA) also identified DIBP presence in aerospace products. The aerospace industry uses DIBP as a constituent within products or formulations for the manufacture, operation and maintenance of aerospace products. The major use of DIBP is in casting sealant (EPA-HQ-OPPT-2018-0434-0007).

Examples of CDR Submissions

Use of DIBP for Processing – incorporation into article for plasticizers in: plastic product manufacturing is reported in the 2016 CDR by one company (U.S. EPA, 2019a). In 2016, one CDR company reported import manufacturing of DIBP, with the manufacturer producing a solid for use in the transportation equipment sector.

E.4 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Plasticizers (Adhesive Manufacturing; Plastic Product Manufacturing)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce—in this case as a plasticizer in plastic product manufacturing and adhesive manufacturing. In manufacturing of plastic material and resin through non-PVC and PVC compounding, DIBP is blended into polymers. Compounding involves the mixing of the polymer with the plasticizer and other chemical such as fillers and heat stabilizers. The plasticizer needs to be absorbed into the particle to impart flexibility to the polymer. For PVC compounding, compounding occurs through mixing of ingredients to produce a powder (dry blending) or a liquid (Plastisol blending). The most common process for dry blending involves heating the ingredients in a high-intensity mixer and transfer to a cold mixer. The Plastisol blending is done at ambient temperature using specific mixers that allow for the breakdown of the PVC agglomerates and the absorption of the plasticizer into the resin particle.

DIBP is also used within products or formulations for the manufacture, operation, and maintenance of aerospace products. The major use of DIBP is in casting sealant (EPA-HQ-OPPT-2018-0434-0007).

There are existing adhesive and sealant products that contain DIBP. Information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products (Azon USA Inc, 2017). Another product, known as Chem-Set C-19, is a seaming adhesive (Chemical Concepts Inc, 2014). A third product is Glue 360, which serves as a two-component solid-surface adhesive (Glue 360 Inc, 2018). Earthjustice commented that Sika, an importer of DIBP that has ceased use, "stated it had imported the plasticizer for use in the transportation and equipment manufacturing, construction, and adhesive manufacturing sectors. Sika reported that DIBP was used in consumer products in the adhesive and sealant sector, with a maximum concentration between 30 and 60 percent by weight, but not in products intended for children. A literature search for Sika products containing DIBP, from roofing membranes to sealants and adhesives, did not identify any products in which this ingredient is disclosed" (EPA-HQ-OPPT-2018-0434-0014).

Examples of CDR Submissions
In 2016, one CDR company reported Processing, incorporation into formulation, mixture, or reaction product for adhesive manufacturing of DIBP. Use of DIBP for Processing – incorporation into formulation, mixture, or reaction product – plastic product manufacturing is reported in the 2016 CDR by one company in a liquid physical form (U.S. EPA, 2019a).

E.5 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Solvents (Which Become Part of Product Formulations or Mixture) (Plastic Material and Resin Manufacturing; Paints and Coatings)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, EPA received information that DIBP is processed, as part of a mixture, into a product in plastic material and resin manufacturing and paints and coatings (U.S. EPA, 2020c).

The manufacturer of Uniplex-155, a DIBP product, stated DIBP is used as a solvent or plasticizer in the production of plastic and rubber products and that it could be used in production of catalysts for polyolefin production or as plasticizer in paint additives (LANXESS, 2021a, 2015).

Examples of CDR Submissions
In 2012, one company reported processing, incorporation into formulation, mixture, or reaction product as a solvent (which become part of product formulations or mixture) for plastic material and resin manufacturing (U.S. EPA, 2019a).

E.6 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Processing Aids Not Otherwise Listed

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, EPA was provided information for a product known as Uniplex-155. The manufacturer detailed that Uniplex-155 is used as an additive as a processing aid in foundry solutions (LANXESS, 2021a).

E.7 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Foam for Pipeline Pigs

This COU refers to DIBP as it is used in various industrial sectors as a component for foam used as a cleaning component on pipeline pigs. DIBP has been found in formulations for this use at approximately 1 to 5 percent (LANXESS, 2021a).

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.8 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Plastic and Rubber Products Not Covered Elsewhere

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, DIBP is listed in a product category for plastic and rubber products not covered elsewhere. The product Uniplex 155 lists DIBP as a solvent or plasticizer in the production of plastic and rubber products (LANXESS, 2015) and "plastic and rubber products not covered elsewhere" was reported in the commercial use life cycle in the 2016 CDR cycle (U.S. EPA, 2019a).

Examples of CDR Submissions

Use of DIBP for the Commercial Use category – plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form (U.S. EPA, 2019a).

E.9 Processing – Incorporation into Formulation, Mixture, or Reaction Product – Pre-Catalyst Manufacturing (*e.g.*, Catalyst Component for Polyolefins Production)

This COU refers to the preparation of a product; that is, the incorporation of DIBP into formulation, mixture, or a reaction product that occurs when a chemical substance is added to a product (or product mixture) after its manufacture, for distribution in commerce. In this case, DIBP is purchased from a U.S. supplier and arrive in drums or totes, then the phthalate is emptied into a storage vessel or feed vessel, under gravity feed. It is sealed to prevent water and air penetration, and samples are pulled in a way that avoids exposure to air or moisture. DIBP is used as an electron donor in pre-catalyst formulations that are ultimately used as a catalyst intermediate in polypropylene (PP) manufacturing (Company Withheld, XXXX; W.R. Grace & Company, 2022). Phthalates, like DIBP, are included in the solids in the pre-catalyst at about 10 percent. The phthalate itself is not a catalyst but is a solid that is suspended in a solvent or an oil. The solid is 20 to 25 percent weight dry pre-catalyst, resulting in 2 to 2.5 percent of phthalate in the drums. That material is then sold to their customers (W.R. Grace & Company, 2024a). One company stated that DIBP could be used in production of catalysts for polyolefin production (LANXESS, 2021a).

Examples of CDR Submissions

No manufacturers reported this use for DIBP in the 2012 or 2016 CDR cycles (U.S. EPA, 2019a). EPA was informed of this COU as a pre-catalyst component for polyolefins production during a meeting with the DIBP Consortium (W.R. Grace & Company, 2024a).

E.10 Processing – Processing as a Reactant – Intermediate (Plastic Manufacturing)

This COU refers to a chemical substance that is used in chemical reactions for the manufacturing of another chemical substance or product. In this case, DIBP is used in a catalyst formulation for processing as a reactant in the generation of polyolefins (*i.e.*, polypropylene and polyethylene). One company stated that DIBP could be used in production of catalysts for polyolefin production (LANXESS, 2021a). EPA spoke with the company producing and selling the pre-catalyst product and were informed that very small amounts are used for the catalyst (*i.e.*, 1 g used for 40,000 g of polypropylene) and the catalyst is mostly destroyed during the reaction (*i.e.*, 1 to 3 ppm remain in polyolefin plastic) (W.R. Grace & Company, 2024a). The phthalate then remains in polymer where it is encapsulated.

Examples of CDR Submissions

No manufacturers reported this use for DIBP in the 2012 or 2016 CDR cycles (U.S. EPA, 2019a). EPA was informed of this use via the DIBP Consortium and the company (W.R. Grace & Company, 2024a); EPA-HQ-OPPT-2018-0434-0049.

E.11 Processing – Repackaging (*e.g.*, Laboratory Chemicals)

Repackaging refers to the preparation of DIBP for distribution in commerce in a different form, state, or quantity than originally received or stored by various industrial sectors—including chemical product and preparation manufacturing, wholesale and retail trade, and laboratory chemicals manufacturing. This COU includes the transferring of DIBP from a bulk container into smaller containers but would not apply to the relabeling or redistribution of a chemical substance without removing the chemical substance from the original shipping container.

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a); however, one company provided an SDS that was updated in August 2024 for DIBP as a laboratory use and shared information about the repackaging process that takes place for phthalate chemicals (U.S. EPA, 2020a, 2019a; UCSF, 2019).

E.12 Processing – Recycling

This COU refers to the process of treating generated waste streams (*i.e.*, which would otherwise be disposed of as waste), containing DIBP, that are collected, either on-site or at a third-party site, for commercial purposes. DIBP is primarily recycled industrially in the form of DIBP-containing PVC waste streams. New PVC can be manufactured from recycled and virgin materials at the same facility. EPA notes that although DIBP was not reported for recycling in the 2016 or 2020 CDR reporting periods, recycling waste streams could contain DIBP (U.S. EPA, 2020a, 2019a).

DIBP is also reported to be in a component of tire crumb rubber, which is used in playgrounds and playing fields. DIBP may also be a part of other components in playing field based on results of federal research on exposure to chemicals in outdoor and indoor playing fields (U.S. EPA, 2019e).

E.13 Distribution in Commerce

For purposes of assessment in this risk evaluation, distribution in commerce consists of the transportation associated with the moving of DIBP or DIBP-containing products between sites, manufacturing, processing, or recycling DIBP or DIBP-containing products, to final use sites or for final disposal of DIBP or DIBP-containing products. More broadly under TSCA, "distribution in commerce" and "distribute in commerce" are described under TSCA section 3(5).

E.14 Industrial Use – Paints and Coatings

This COU refers to DIBP as it is used in various industrial sectors as a component of paints and coating mixtures, meaning the use of DIBP after it has already been incorporated into a paint or coating product or mixture, as opposed to when it is used upstream, (*e.g.*, when DIBP is processed into a coating formulation). DIBP products list coatings as a recommended use as a plasticizer in paint additives (Aceto US LLC, 2022; LANXESS, 2021a).

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.15 Industrial Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU refers to DIBP as it is used in various industrial sectors as a component of plastic and rubber products not covered elsewhere, meaning the use of DIBP after it has already been incorporated into a plastic or rubber product or mixture, as opposed to when it is used upstream, (*e.g.*, when DIBP is processed into a coating formulation). In the 2016 CDR cycle DIBP is reported under the Commercial Use category for plastic and rubber products not covered elsewhere (U.S. EPA, 2019a).

The Center for Environmental Health (CEH) commented that DIBP is often a byproduct or intermediate in the production of phthalate containing plastics (EPA-HQ-OPPT-2018-0434-0005). Given the use of DIBP as a general-purpose plasticizer for PVC and non-PVC applications, DIBP has been noted to be in a variety of articles such as food conveyor belts, tarps, weather stripping and traffic cones (U.S. EPA, 2020e).

The type of products being reported under this code are likely to be industrial, commercial, and consumer in nature. The expected users of products under this category would be anticipated to use liquid or solid mixtures containing DIBP and mold or otherwise form the various products for industrial, commercial, and consumer applications.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts (EPA-HQ-OPPT-2019-0131-0022). In total, in IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle and include door, hood, and convertible top assemblies (EPA-HQ-OPPT-2019-0131-0022). DIBP has also been found in tire crumb (U.S. EPA, 2019e, 2016a).

Examples of CDR Submissions

Use of DIBP for the Commercial Use product category: plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form (U.S. EPA, 2019a).

E.16 Industrial Use – Adhesives and Sealants (Two-Component Glues and Adhesives; Transportation Equipment Manufacturing)

This COU refers to DIBP as it is used in various industrial sectors as a component of adhesive or sealant mixtures—meaning the use of DIBP after it has already been incorporated into an adhesive and/or sealant for transportation equipment manufacturing product or mixture, as opposed to when it is used upstream. For example, when DIBP is processed into the adhesive and sealant formulation.

DIBP has been listed as a constituent within products or formulations for the manufacture, operation, and maintenance of aerospace products. DIBP is used in casting sealant (EPA-HQ-OPPT-2018-0434-0007). In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts (EPA-HQ-OPPT-2019-0131-0022). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. MEMA members reported using DIBP in non-dimensional uses such as adhesives and sealants as well (EPA-HQ-OPPT-2019-0131-0022).

There are existing adhesive products that contain DIBP. According to information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products (Azon USA Inc, 2017). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and may still be manufactured using DIBP (Chemical Concepts Inc, 2014). A third product called Glue 360, which is manufactured with DIBP, serves as a two-component solid surface adhesive (Glue 360 Inc, 2018).

Examples of CDR Submissions
Use of DIBP for the industrial sector as a plasticizer for adhesive and sealant manufacturing was reported by one manufacturer in the 2016 CDR (U.S. EPA, 2019a).

E.17 Commercial Use – Adhesives and Sealants (Two-Component Glues and Adhesives)

This COU is referring to the commercial use of DIBP in adhesives and sealants. This means the use of DIBP-containing adhesives and sealants in a commercial setting, such as a business or at a job site, as opposed to upstream use of DIBP (*e.g.,* when DIBP containing products are used in the manufacturing of transportation equipment) or use in an industrial setting.

Workers in a commercial setting generally apply adhesives and sealants that already have DIBP incorporated as a plasticizer. Adhesives and sealants (which could also be fillers and putties) are highly malleable materials used to repair, smooth over, or fill minor cracks in holes and buildings.

DIBP use is covered under industrial and processing COUs and use could occur in the commercial sector use as well (during *e.g.*, repair of transportation equipment). DIBP has been listed as a constituent within products or formulations for the manufacture, operation, and maintenance of aerospace products. The major use of DIBP is in casting sealant (EPA-HQ-OPPT-2018-0434-0007).

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts (EPA-HQ-OPPT-2019-0131-0022). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies. Alliance members reported using DIBP in non-dimensional uses such as adhesives and sealants as well (EPA-HQ-OPPT-2019-0131-0022).

There are existing adhesive products that contain DIBP. According to information provided to the EPA, such as the SDS from 2017 for a product called Azo-Cat 25, identified the use DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products (Azon USA Inc, 2017). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and could still be manufactured using DIBP (Chemical Concepts Inc, 2014). A third product called Glue 360 that is manufactured with DIBP serves as a two-component solid surface adhesive (Glue 360 Inc, 2018).

Examples of CDR Submissions

Use of DIBP in the commercial sector as a plasticizer for adhesive and sealant products was reported by one manufacturer in the 2016 CDR (U.S. EPA, 2019a).

E.18 Commercial Use – Paints and Coatings

This COU is referring to the commercial use of DIBP already incorporated as a plasticizer in paint and coating products. EPA found coating use in a product known as ACETO, so use could occur in a commercial setting (Aceto US LLC, 2022). DIBP products list coatings as a recommended use and one company stated that DIBP could be used in production of catalysts for polyolefin production or as a plasticizer in paint additives (LANXESS, 2021a).

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.19 Commercial Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU is referring to the commercial use of DIBP as a plasticizer in various articles with routine direct contact during normal use including rubber and plastic articles. In the 2016 CDR cycle DIBP is reported under the Commercial Use category for plastic and rubber products not covered elsewhere (U.S. EPA, 2019a).

CEH commented that DIBP is often a byproduct or intermediate in the production of phthalate containing plastics (EPA-HQ-OPPT-2018-0434-0005). Given the use of DIBP as a general-purpose plasticizer for PVC and non-PVC applications, DIBP has been noted to be in a variety of articles such as food conveyor belts, tarps, weather stripping, and traffic cones (U.S. EPA, 2020e).

The type of products being reported under this code are likely to be industrial, commercial, and consumer in nature. The expected users of products under this category would be anticipated to use liquid or solid mixtures containing DIBP and mold or otherwise form the various products for industrial, commercial, and consumer applications.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts (EPA-HQ-OPPT-2019-0131-0022). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies (EPA-HQ-OPPT-2019-0131-0022). DIBP has also been found in tire crumb (U.S. EPA, 2019e, 2016a). Given commercial use of tire auto parts may include direct contact with DIBP articles in rubber, EPA is currently assessing tire replacement scenarios.

Examples of CDR Submissions

Use of DIBP in the commercial sector as a plasticizer for other articles with routine direct contact during normal use including rubber articles; plastic articles (hard), was reported by one manufacturer in the 2020 CDR (U.S. EPA, 2020a).

E.20 Commercial Use – Laboratory Chemicals

This COU is referring to the commercial use of DIBP in laboratory chemicals.

DIBP can be used as a laboratory chemical, such as a chemical standard or reference material during analyses. Some laboratory chemical manufacturers identify use of DIBP as a certified reference material and research chemical (U.S. EPA, 2020c). The users of products under this category would be expected to apply these products through general laboratory use applications. Commercial Use of laboratory chemicals may involve handling DIBP by hand-pouring and either adding to the appropriate labware in its pure form to be diluted later or added to dilute other chemicals already in the labware.

This use was not reported to EPA in the 2016 or 2020 CDR reporting cycles; however, EPA has reviewed SDSs for a DIBP product that is used to synthesize substances for laboratory chemicals (Sigma-Aldrich, 2024; U.S. EPA, 2020a, 2019a).

E.21 Commercial Use – Toys, Playground, and Sporting Equipment

This COU is referring to the commercial use of DIBP in subcategory of toys, playground, and sporting equipment. DIBP is reported to be a component of tire crumb rubber, which is used in playgrounds and playing fields (U.S. EPA, 2019e, 2016a). DIBP may also be a part of other components in playing field based on results of federal research on exposure to chemicals in outdoor and indoor playing fields (U.S. EPA, 2016a).

DIBP was detected in synthetic turf during a study that included 546 recycled tire crumb samples from 91 fields (U.S. EPA, 2019e). DIBP was found in both indoor and outdoor playing fields.

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.22 Consumer Use – Floor Coverings

This COU is referring to the consumer use of DIBP in floor coverings.

DIBP was reported in two carpet tile samples obtained from a U.S. retailer (EPA-HQ-OPPT-2018-0434-0014). One carpet contained DIBP concentrations of 230 ppm in the backing of a tile carpet product, Super Flor 41Z. Super Flor is a tile carpet with face fiber composed of 82.5 percent nylon and 17.5 percent polyester. It has a Graphlar backing made from bitumen. It contains 42 percent post-industrial/pre-consumer recycled content (limestone and polyester). The second carpet contained DIBP concentrations of 210 ppm in the backing of a tile carpet product, On Line Marigold. On Line is a commercial carpet tile with face fiber made from 100 percent recycled Nylon 6 and a Glas-Bac backing made from PVC, including recycled content. Overall, it is made from 72 percent recycled content.

DIBP was identified in vinyl floor coverings during a Danish Ministry of the Environment study, *Phthalates in Products with Large Surfaces* (DTI, 2010). DIBP is also proposed for restriction in a subsequent Danish EPA Annex Report (Danish EPA, 2011). Given the date of these reports, DIBP identified in vinyl floor coverings could be a legacy use in consumer's homes—even if floor coverings containing DIBP are no longer imported.

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.23 Consumer Use – Toys, Playground, and Sporting Equipment

This COU is referring to the consumer use of DIBP in toys, playground, and sporting equipment that contain DIBP in an indoor environment. The use also refers to the DIY building of home sporting equipment. DIBP can be used as a plasticizer to provide flexibility to toys. The Consumer Product Safety Improvement Act (CPSIA) of 2008 limited manufacturers' use of DIBP in children's toys to 0.1 percent (16 CFR part 1307). Toys containing higher concentrations of DIBP that were manufactured and/or processed prior to the CPSIA restriction in 2008 may still be in use. EPA expects that the use of DIBP in toys manufactured or processed prior to the ban may still be occurring (U.S. EPA, 2020b).

DIBP is also reported to be in a component of tire crumb, which is used in playgrounds and playing fields (U.S. EPA, 2019e, 2016a). DIBP may also be a part of other components in playing field based on results of federal research on exposure to chemicals in outdoor and indoor playing fields (U.S. EPA, 2019e). Exposure could occur during the use of the fields.

DIBP was detected in synthetic turf during a study that included 546 recycled tire crumb samples from 91 fields (U.S. EPA, 2019e). DIBP was found in both indoor and outdoor playing fields.

In the *Technical Report on the Conditions of Use* provided by Earthjustice, the commenter highlights the use of DIBP in toys in Europe from a survey of toys sold in Europe published in 2010 that found DIBP was in 2 percent of products obtained in Austria, Germany, the Netherlands, and Switzerland retailers (EPA-HQ-OPPT-2018-0434-0014). The commenter added that Canadian use of DIBP was identified in toys and exercise equipment (*e.g.*, yoga mats, balance balls), according to a 2014 report by Environment Canada.

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.24 Consumer Use – Paints and Coatings

This COU is referring to the consumer use of DIBP already incorporated as a plasticizer in paint and coating products. DIBP products list coatings as a recommended use and one company stated that DIBP could be used in production of catalysts for polyolefin production or as a plasticizer in paint additives (Aceto US LLC, 2022; LANXESS, 2021a).

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.25 Consumer Use – Fabric, Textile, and Leather Products Not Covered Elsewhere (*e.g.*, Textile [Fabric] Dyes)

This COU is referring to the consumer use of DIBP in fabrics, textiles, and leather products not covered elsewhere.

In 2013, EPA received information regarding a product, ICOPOR pigment paste, which is used to color high-solids or solvent-free polyurethane resins and PVC plastisols used to manufacture artificial leathers and textile products (Dow Chemical, 2013). In the DIBP final scope document, the SDS was the basis for the COU of Industrial Use related to fabric, textile and leather products (U.S. EPA, 2020c). According to that document, there appear to be two life cycle stages for which DIBP is used in the product—once when it is formulated to produce a paste and then when it is used as a colorant for artificial leather. Although there was an existing industrial COU, and an additional processing COU, the product is outdated and not believed to be in use anymore. With that stated, the legacy products containing DIBP may still exist for consumers and is why EPA will include consumer use of fabric, textile, and leather products not covered elsewhere in the risk evaluation.

This COU was not reported in the 2016 or 2020 CDR cycles (U.S. EPA, 2020a, 2019a).

E.26 Consumer Use – Other Articles with Routine Direct Contact During Normal Use Including Rubber Articles; Plastic Articles (Hard)

This COU is referring to the consumer use of DIBP in plastics and rubber productions not covered elsewhere.

DIBP is used in various industrial sectors as a component of plastic and rubber products not covered elsewhere (*e.g.*, phone chargers, shower curtains, garden hoses, tape), meaning the use of DIBP after it has already been incorporated into a plastic or rubber product or mixture. DIBP is listed in a product category for Plastic and rubber products not covered elsewhere for commercial use during the 2016 CDR reporting period (U.S. EPA, 2019a).

In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies (EPA-HQ-OPPT-2019-0131-0022). DIBP has also been found in tire crumb (U.S. EPA, 2019e, 2016a). Given DIY replacement of tires and tire parts may include direct contact with DIBP articles in rubber, EPA is currently assessing tire replacement scenarios.

Examples of CDR Submissions

Use of DIBP for the Commercial Use Product Category: Plastic and rubber products not covered elsewhere, is reported in the 2016 CDR by one manufacturer in a liquid form (U.S. EPA, 2019a).

E.27 Consumer Use – Adhesives and Sealants

This COU refers to the consumer use of DIBP in adhesives and sealants.

EPA expects that the use of these types of products would occur in commercial applications; however, the Agency notes that these products are likely to be sourced by DIY consumers through various online vendors.

In its internal data collection, MEMA found DIBP in 37 auto parts such as hood, panel, front, and rear door assemblies; radios; and front bumpers and other parts (EPA-HQ-OPPT-2019-0131-0022). In total, in the IMDS, DIBP is listed in approximately 18,500 parts. These parts are found mostly in the body/exterior of the vehicle, and include door, hood, and convertible top assemblies (EPA-HQ-OPPT-2019-0131-0022). Alliance members reported using DIBP in non-dimensional uses, where the presence of the chemicals does not have a firm physical dimension (such as hard parts do), such as adhesives and sealants as well (EPA-HQ-OPPT-2019-0131-0022). It is likely that consumers repairing their own vehicles (*e.g.*, radio replacement) could be exposed to DIBP in parts.

There are existing adhesive products that contain DIBP. According to information provided to EPA, such as the SDS from 2017 for a product called Azo-Cat 25 that identified the use of DIBP as a component of a catalyst mixture for accelerating the reaction time for waterstop products (Azon USA Inc, 2017). Based on Azo-Cat's use from the SDS, it could be involved in the processing stage. Another product on the market, known as Chem-Set C-19, is a seaming adhesive and is reasonably foreseen as an adhesive that is still manufactured using DIBP (Chemical Concepts Inc, 2014). A third product called Glue 360 that is manufactured with DIBP serves as a two-component solid surface adhesive (Glue 360 Inc, 2018).

Examples of CDR Submissions

Use of DIBP in adhesives and sealant products in the consumer sector was reported by one manufacturer in the 2016 CDR (U.S. EPA, 2019a).

E.28 Disposal

Each of the COUs of DIBP may generate waste streams of the chemical. For purposes of the DIBP risk evaluation, this COU refers to the DIBP in a waste stream that is collected from facilities and households and are unloaded at a treatment or disposed at third-party sites. This COU also encompasses DIBP contained in wastewater discharged to publicly owned treatment works (POTW) or other, non-POTWs for treatment, and other wastes. DIBP is expected to be released to other environmental media, such as introductions of biosolids to soil or migration to water sources, through waste disposal (*e.g.*, disposal of formulations containing DIBP, plastic and rubber products, fabrics, and transportation equipment) (U.S. EPA, 2020c). Disposal may also include destruction and removal by incineration (U.S. EPA, 2021c). Recycling of DIBP and DIBP-containing products is considered a separate COU. Environmental releases from industrial sites are assessed in each COU.

Appendix F OCCUPATIONAL EXPOSURE VALUE DERIVATION

EPA HAS calculated an 8-hour existing chemical occupational exposure value to represent the OES and sensitive health endpoints into a single value. This calculated value may be used to support risk management efforts for DIBP under TSCA section 6(a), 15 U.S.C. § 2605. EPA calculated the value rounded to 1.5 mg/m^3 (0.13 parts per million, or ppm) for inhalation exposures to DIBP as an 8-hour time-weighted average (TWA) for consideration in workplace settings (see Appendix F.1) based on the acute, non-cancer human equivalent concentration (HEC) for developmental toxicity (*i.e.*, decreased fetal testicular testosterone).

Because TSCA requires risk evaluations to be conducted without consideration of costs and other nonrisk factors, this occupational exposure value represents a risk-only number. If risk management for DIBP follows the finalized risk evaluation, EPA may consider costs and other nonrisk factors, such as technological feasibility, the availability of alternatives, and the potential for critical or essential uses. Any existing chemical exposure limit used for occupational safety risk management purposes could differ from the occupational exposure value presented in this appendix based on additional consideration of exposures and nonrisk factors consistent with TSCA section 6(c).

This calculated value for DIBP represents the exposure concentration below which exposed workers and ONUs are not expected to exhibit any appreciable risk of adverse toxicological outcomes, accounting for PESS. It is derived based on the most sensitive human health effect (*i.e.*, decreased fetal testicular testosterone) and exposure duration (*i.e.*, acute) relative to benchmarks and a standard occupational scenario assumption of an 8-hour workday.

EPA expects that at the occupational exposure value of 0.13 ppm (1.5 mg/m^3), a worker or ONU also would be protected against developmental toxicity from intermediate and chronic duration occupational exposures if ambient exposures are kept below this occupational exposure value. The Agency has not separately calculated a short-term (*i.e.*, 15-minute) occupational exposure value because EPA did not identify hazards for DIBP associated with this very short duration.

The Occupational Safety and Health Administration (OSHA) has not set a permissible exposure limit (PEL) as an 8-hour TWA for DIBP (accessed December 29, 2025). EPA located several occupational exposure limits for DIBP (CASRN 84-69-5) in other countries (https://ilv.ifa.dguv.de/limitvalues/21276; accessed December 29, 2025). Identified 8-hour TWA values range from 1 mg/m^3 in Latvia to 5 mg/m^3 in Ireland, New Zealand, South Africa, and the United Kingdom. Additionally, EPA found that New Zealand and the United Kingdom (accessed December 29, 2025) have both established an occupational exposure limit of 5 mg/m^3 (8-hour TWA) in each country's code of regulation that is enforced by each country's worker safety and health agency.

F.1 Occupational Exposure Value Calculations

This appendix presents the calculations used to estimate occupational exposure values using inputs derived in this risk evaluation. Multiple values are presented below for hazard endpoints based on different exposure durations. For DIBP, the most sensitive occupational exposure value is based on non-cancer developmental effects and the resulting 8-hour TWA is rounded to 1.5 mg/m^3.

Acute Non-Cancer Occupational Exposure Value

The acute occupational exposure value (EV_{acute}) was calculated as the concentration at which the acute MOE would equal the benchmark MOE for acute occupational exposures using Equation_Apx F-1:

Equation_Apx F-1.

$$\mathrm{EV_{acute}} = \frac{\mathrm{HEC_{acute}}}{Benchmark\ MOE_{acute}} * \frac{\mathrm{AT_{HECacute}}}{ED} * \frac{\mathrm{IR_{resting}}}{\mathrm{IR_{workers}}} =$$

$$\frac{2.7\ \mathrm{ppm}}{30} * \frac{\frac{24h}{d}}{\frac{8h}{d}} * \frac{0.6125\,\frac{\mathrm{m^3}}{hr}}{1.25\,\frac{\mathrm{m^3}}{hr}} = 0.13\ \mathrm{ppm}$$

$$EV_{acute}\left(\frac{\mathrm{mg}}{\mathrm{m^3}}\right) = \frac{EV\ ppm\ * MW}{Molar\ Volume} = \frac{0.13\ \mathrm{ppm} * 278.35\,\frac{g}{mol}}{24.45\ \frac{L}{mol}} = 1.5\ \frac{\mathrm{mg}}{\mathrm{m^3}}$$

Intermediate Non-Cancer Occupational Exposure Value

The intermediate occupational exposure value ($EV_{intermediate}$) was calculated as the concentration at which the intermediate MOE would equal the benchmark MOE for intermediate occupational exposures using Equation_Apx F-2:

Equation_Apx F-2.

$$\mathrm{EV_{intermediate}} = \frac{\mathrm{HEC_{intermediate}}}{Benchmark\ MOE_{\mathrm{intermediate}}} * \frac{\mathrm{AT_{HEC\ intermediate}}}{ED*EF} * \frac{\mathrm{IR_{resting}}}{\mathrm{IR_{workers}}}$$

$$= \frac{2.7\ \mathrm{ppm}}{30} * \frac{\frac{24h}{d} * 30d}{\frac{8h}{d} * 22d} * \frac{0.6125\,\frac{\mathrm{m^3}}{hr}}{1.25\,\frac{\mathrm{m^3}}{hr}} = 0.18\ \mathrm{ppm} = 2.1\ \frac{\mathrm{mg}}{\mathrm{m^3}}$$

Chronic Non-Cancer Exposure Value

The chronic occupational exposure value ($EV_{chronic}$) was calculated as the concentration at which the chronic MOE would equal the benchmark MOE for chronic occupational exposures using Equation_Apx F-3:

Equation_Apx F-3.

$$\mathrm{EV_{chronic}} = \frac{\mathrm{HEC_{chronic}}}{Benchmark\ MOE_{chronic}} * \frac{\mathrm{AT_{HEC\ chronic}}}{ED*EF*WY} * \frac{\mathrm{IR_{resting}}}{\mathrm{IR_{workers}}}$$

$$= \frac{2.7\ \mathrm{ppm}}{30} * \frac{\frac{24h}{d}*\frac{365d}{y}*40\ y}{\frac{8h}{d}*\frac{250d}{y}*40\ y} * \frac{0.6125\frac{\mathrm{m^3}}{hr}}{1.25\frac{\mathrm{m^3}}{hr}} = 0.19\ \mathrm{ppm} = 2.2\ \frac{\mathrm{mg}}{\mathrm{m^3}}$$

Where:

$AT_{HECacute}$	=	Averaging time for the POD/HEC used for evaluating non-cancer acute occupational risk based on study conditions and HEC adjustments (24 h/day).

$AT_{HECintermediate}$	=	Averaging time for the POD/HEC used for evaluating non-cancer intermediate occupational risk based on study conditions and/or any HEC adjustments (24 h/day for 30 days).
$AT_{HECchronic}$	=	Averaging time for the POD/HEC used for evaluating non-cancer chronic occupational risk based on study conditions and/or HEC adjustments (24 h/day for 365 days/year) and assuming the same number of years as the high-end working years (WY, 40 years) for a worker.
$Benchmark\ MOE_{acute}$	=	Acute non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
$Benchmark\ MOE_{intermediate}$	=	Intermediate non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
$Benchmark\ MOE_{chronic}$	=	Chronic non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
EV_{acute}	=	Acute occupational exposure value
$EV_{intermediate}$	=	Intermediate occupational exposure value
EV_{chronic}	=	Chronic occupational exposure value
ED	=	Exposure duration (8 h/day)
EF	=	Exposure frequency (1 day for acute, 22 days for intermediate, and 250 days/year for chronic and lifetime)
HEC	=	Human equivalent concentration for acute, intermediate, or chronic non-cancer OES
IR	=	Inhalation rate (default is 1.25 m^3/h for workers and 0.6125 m^3/h assumed from “resting” animals from toxicity studies)
$Molar\ Volume$	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW	=	Molecular weight of DIBP (278.35 g/mole)
WY	=	Working years per lifetime at the 95th percentile (40 years).

Unit conversion:

1 ppm = 11.38 mg/m^3 (see equation associated with the EV_{acute} calculation)