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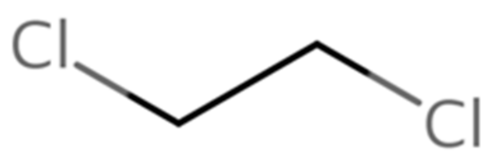
Office of Chemical Safety and
Pollution Prevention

Draft Risk Evaluation for 1,2-Dichloroethane

CASRN 107-06-2



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Docket

Supporting information can be found in the public docket, Docket ID EPA-HQ-OPPT-2018-0427.

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EXECUTIVE SUMMARY

Background

EPA evaluated the chemical 1,2-dichloroethane across its conditions of use (COUs) under the Toxic Substances Control Act (TSCA), ranging from manufacture to disposal. In this draft risk evaluation, the Agency is preliminarily determining that 1,2-dichloroethane presents an unreasonable risk of injury to human health and the environment driven by the following: (1) workers, including occupational non-users (ONUs), from 15 COUs; and (2) the environment from 2 COUs. Of the 20 COUs EPA evaluated for 1,2-dichloroethane (see Appendix E), 5 COUs were preliminarily determined to not contribute to unreasonable risk to human health or the environment. The Agency did not preliminarily identify unreasonable risk to consumers or the general population associated with any COU as a contributor to the unreasonable risk determination for 1,2-dichloroethane.

In December 2019, EPA designated 1,2-dichloroethane as a high-priority substance for TSCA evaluation and in August 2020 released the *Final Scope of the Risk Evaluation for 1,2-Dichloroethane; CASRN 107-06-2* (U.S. EPA, 2020c). This draft risk evaluation assesses human health risk to workers, including ONUs; consumers, including bystanders; and the general population exposed to 1,2-dichloroethane from environmental releases. It also assesses risk to the environment, including risk to aquatic and terrestrial species. Manufacturers report 1,2-dichloroethane production volumes through the Chemical Data Reporting (CDR) rule under the associated CAS Registry Number (CASRN; accessed November 10, 2025) 107-06-2. The production volume, which includes imports, for 1,2-dichloroethane between 2016 and 2019 ranged from 30 to 40 billion pounds (lb) based on the latest 2020 CDR data (U.S. EPA, 2025ay).[1]

Also known as ethylene dichloride, 1,2-dichloroethane is a volatile, colorless, and oily liquid with a chloroform-like odor that is primarily used in the synthesis of vinyl chloride; over 90 percent of produced 1,2-dichloroethane is converted to vinyl chloride (EPA-HQ-OPPT-2018-0427-0040). It is soluble in water (8,600 mg/L) and is miscible in most organic solvents. 1,2-Dichloroethane is persistent in the environment and slowly degrades over months to years if released to air, water, soil, and sediment. Estimated bioconcentration and bioaccumulation factors indicate that 1,2-dichloroethane is not likely to bioaccumulate in aquatic or terrestrial organisms.

Laboratory animal studies have been conducted to determine whether exposure to 1,2-dichloroethane can cause a range of non-cancer and cancer health effects and suggest that 1,2-dichloroethane can be harmful to people if they are exposed at sufficient levels. See the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (also called “draft human health assessment for 1,2-dichloroethane”) (U.S. EPA, 2024b) that was released for public comment in July 2024 and independent peer review by the Science Advisory Committee on Chemicals (SACC) in September 2024 as part of their review of the *Draft Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2024c). This draft risk evaluation reflects SACC and public comments received on the draft human health assessment for 1,2-dichloroethane.

In this draft risk evaluation, EPA assessed whether manufacturing, processing, distribution in commerce, use, or disposal of 1,2-dichloroethane contributes to unreasonable risk to human health or the environment under COUs subject to TSCA. Note that human or environmental exposure to 1,2-dichloroethane through uses that are not subject to TSCA (*e.g.*, commercial use of 1,2-dichloroethane in embalming fluid, use as a food additive) were not evaluated by the Agency. This is because such uses are excluded from TSCA’s definition of “chemical substance.” Although EPA’s preliminary

[1] A preliminary review of the 2024 CDR data indicates that the reported total production volume for 1,2-dichoroethane remained within the same range as that reported in 2020.

determination in this draft risk evaluation that 15 COUs contribute to an unreasonable risk determination for 1,2-dichloroethane, this determination cannot be extrapolated to form conclusions about uses of 1,2-dichloroethane that are not subject to TSCA, which the Agency did not evaluate.

EPA evaluated risks resulting from exposure to the following byproducts produced during the manufacture of 1,2-dichloroethane (collectively referred to as "the byproducts"): 1,1-dichloroethane (CASRN 75-34-3), trichloroethylene (CASRN 79-01-6), perchloroethylene (CASRN 127-18-4), methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5). Although the manufacture of 1,2-dichloroethane also produces *trans*-1,2-dichloroethylene (CASRN 156-60-5) and 1,1,2-trichloroethane (CASRN 79-00-5) as byproducts, these chemicals will be assessed in forthcoming risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene.[2]

As reported in multiple EPA databases,[3] 1,2-dichloroethane is released to air, surface waters (including sediments), and land and will partition between these environmental media. The Agency evaluated facility-specific or modeled releases to air, water, and land for each COU scenario and estimated potential exposures to the general population and environment. EPA also evaluated the risks to workers and ONUs exposed to 1,2-dichloroethane in and near the workplace as well as through releases to the ambient environment (air and water). For acute, intermediate, and chronic inhalation exposures, personal breathing zone (PBZ) inhalation monitoring data obtained through two test orders were used.[4] For dermal exposures, EPA also considered test order information.[5] The general population—specifically, people who reside near facilities that manufacture or process 1,2-dichloroethane—can be exposed when those facilities release 1,2-dichloroethane into the environment. EPA used chemical-specific data where available; however, surrogate data and modeling were used to characterize certain scenarios that lacked monitoring data (*e.g.*, industrial application of adhesives and sealants use of 1,2-dichloroethane).

Determining Unreasonable Risk to Human Health

EPA's TSCA existing chemical 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 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 2024 risk evaluation framework rule and as required under TSCA (U.S. EPA, 2024d). Risk-related factors beyond the levels of 1,2-dichloroethane that can impact the unreasonable risk determination include, but are not limited to, the type of health effect under consideration, the reversibility of the health effect being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), population exposed (including any potentially exposed or susceptible subpopulations [PESS]), as well as EPA's confidence in the information used to inform the

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[2] Hazards values for these chlorinated solvents are still under review and will be included in their forthcoming draft risk evaluations for each of these chemicals.

[3] EPA compiled release data for 1,2-dichloroethane from TRI (Toxics Release Inventory), NEI (National Emissions Inventory), and DMR (Discharge Monitoring Reports) during the 2015 to 2020 timeframe. Preliminary review of the 2021 to 2023 TRI, 2021 to 2025 DMR, and 2020 NEI release data indicates that releases are generally on the same order of magnitude as the 2015 to 2020 releases.

[4] TSCA section 4(a)(2)(A)(i) allows the EPA to impose testing requirements via "rule, order, or consent agreement" whenever new information "is necessary" in order to perform a risk evaluation (15 U.S.C. 2603(a)(2)(A)(i)). The Agency issued a test order for 1,2-dichloroethane on January 14, 2021; see https://www.epa.gov/sites/default/files/2021-01/documents/tsca_section_4a2_order_for_12-dichloroethane_on_ecotoxicity_and_occupational_exposure_0.pdf (Stantec ChemRisk, 2024). EPA also received inhalation monitoring data from the test order submission for 1,1-dichloroethane manufactured as a byproduct in the manufacture of 1,2-dichloroethane (Stantec ChemRisk, 2023).

[5] EPA received additional data on dermal exposure from the same test order for 1,2-dichloroethane (Labcorp Early Development, 2024).

hazard and exposure values. These considerations are included as part of the evaluation of hazard and exposure to 1,2-dichloroethane. If an estimate of risk for a specific scenario exceeds the standard risk benchmarks, then the determination of whether those risks significantly contribute to the unreasonable risk of 1,2-dichloroethane under TSCA is both case-by-case and context-driven. EPA considers all of the aforementioned risk-related factors when making a determination of whether a COU under TSCA significantly contributes to unreasonable risk.

To preliminarily determine whether 1,2-dichloroethane presents an unreasonable risk of injury to human health, EPA considered the following PESS in its assessment: infants exposed to drinking water during formula bottle feeding, subsistence and Tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and fenceline communities. These subpopulations are PESS because some have greater exposure to 1,2-dichloroethane per body weight (*e.g.*, infants, children, adolescents) while others can experience exposure from multiple sources, higher exposures than others, or exhibit greater biological susceptibility than the general population. Although variability in susceptibility across the human population is likely, EPA did not identify specific human groups that are expected to be more susceptible to cancer or non-cancer effects following 1,2-dichloroethane exposure.

The Agency assessed risks to people exposed to 1,2-dichloroethane at work, indoors, and outdoors using a combination of screening level and more refined approaches. EPA evaluated reasonably available information for human health hazards from 1,2-dichloroethane and based on hazard data, exposure to 1,2-dichloroethane may increase the risk of (1) non-cancer renal effects in workers from acute, intermediate, and chronic dermal exposure; (2) non-cancer olfactory effects in workers and ONUs from acute inhalation exposure; (3) non-cancer male reproductive effects in workers and ONUs from intermediate and chronic inhalation exposure; and (4) cancer risk for tumors to workers from inhalation and dermal exposures, to ONUs from inhalation exposures, and to the general population in proximity to releasing facilities from inhalation exposures. Workers with the greatest potential for exposure are those who work directly with the chemical in environments where 1,2-dichloroethane is manufactured, processed, or disposed of. The Agency preliminarily identified significant contributions to unreasonable risk for both non-cancer health effects and cancer risk to workers and ONUs from inhalation and dermal exposures.

EPA evaluated exposures to the general population associated with (1) breathing the ambient air in proximity to where 1,2-dichloroethane was released from facilities; and (2) ingesting drinking water, surface water, or soil from 1,2-dichloroethane releases to land. The Agency is preliminarily determining that inhalation exposures of 1,2-dichloroethane to the general population do not significantly contribute to unreasonable risk.

EPA is preliminarily determining that consumer exposures to 1,2-dichloroethane do not significantly contribute to unreasonable risk.

EPA considered the weight of scientific evidence to determine confidence levels in underlying datasets and risk estimates for human health (Section 5.3.8). For the general population, the Agency has slight[6] to robust confidence in inhalation risk estimates from ambient air and robust confidence in oral and dermal risk estimates from other pathways (drinking water intake, fish ingestion, and incidental ingestion via

[6] EPA has slight confidence in inhalation risk estimates from ambient air for the Commercial aerosol products occupational exposure scenario (OES).

swimming and pica of soil) (Section 5.3.8.2), depending on the source of data for each COU. For workers, EPA has slight to robust confidence in the risk estimates calculated for inhalation exposure scenarios and moderate to robust confidence in the risk estimates for dermal exposure scenarios, depending on the source of data for each COU (Section 5.3.8.1). For consumers, EPA has robust confidence in the risk estimates calculated for inhalation, ingestion, and dermal exposure scenarios and robust confidence that the consumer exposure scenarios represent a conservative upper bound on exposure (Section 5.3.8.3).

Determining Unreasonable Risk to the Environment

In determining whether 1,2-dichloroethane presents an unreasonable risk of injury to the environment, EPA considered the following groups of organisms in its assessment: aquatic vertebrates, aquatic invertebrates, benthic invertebrates, aquatic plants and algae, terrestrial mammals, soil invertebrates, and terrestrial plants. Specifically, EPA assessed 1,2-dichloroethane exposures to the environment through the manufacturing, processing, use, or disposal of 1,2-dichloroethane. Exposure to aquatic species was evaluated through surface water and sediment; exposure to terrestrial species was evaluated through soil, surface water, and sediment. To characterize benthic environmental hazard, the Agency used 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane as chemical analogs for 1,2-dichloroethane.

The Agency weighed the scientific evidence to determine confidence levels in underlying datasets and risk estimates for the environment (Section 4.3). EPA has moderate to robust confidence in its environmental risk estimates, depending on the source of environmental release information for each COU (Section 4.3.5). The Agency is preliminarily determining that two COUs significantly contribute to the unreasonable risk of injury to the environment due to chronic exposure to aquatic invertebrates via surface water and sediment.

Conclusions

EPA is preliminarily determining that of the 20 COUs evaluated for 1,2-dichloroethane, 15 COUs significantly contribute to unreasonable risk to human health and the environment.

Of the 15 COUs significantly contributing to unreasonable risk, the Agency is preliminarily determining that the following 2 COUs significantly contribute to unreasonable risk of injury to the environment due to chronic exposure to aquatic invertebrates via surface water and sediment:

- Manufacturing – domestic manufacture; and
- Disposal.

EPA evaluated 19 COUs with exposures to workers and ONUs for 1,2-dichloroethane and is preliminarily determining that 1,2-dichloroethane presents an unreasonable risk of injury to human health due to non-cancer health effects and cancer risk to workers and ONUs from inhalation and dermal exposures.

Of the 15 COUs significantly contributing to unreasonable risk, the Agency is preliminarily determining that all 15 significantly contribute to unreasonable risk of 1,2-dichloroethane due to inhalation and dermal risks to workers and inhalation risks to ONUs:

- Manufacturing – domestic manufacture;
- Manufacturing – import;
- Processing – repackaging;

- Processing – as a reactant – intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – fuels and fuel additives and all other petroleum and coal products manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – processing aids: specific to petroleum production; plastics material and resin manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing;
- Processing – recycling;
- Industrial use – adhesives and sealants;
- Industrial use – lubricants and greases – solid film lubricants and greases
    - *[Note: no dermal risk found for this COU]*;
- Industrial use – other use – process solvent;
- Industrial use – process regulator – *e.g.*, catalyst moderator, oxidation inhibitor;
- Industrial use – solvents (for cleaning and degreasing) – degreasing and cleaning solvents;
- Commercial use – other use – laboratory chemical; and
- Disposal.

EPA evaluated unreasonable risk of injury to human health to the general population under the COUs. Based on the draft risk estimates calculated using release information from manufacturing, processing, and commercial uses of 1,2-dichloroethane, as well as related risk factors, the Agency is preliminarily determining that 1,2-dichlorethane does not present an unreasonable risk to the general population.

EPA is preliminarily determining that the following five COUs do not contribute to unreasonable risk of injury to human health (*i.e.*, workers, ONUs, consumers, and general population in proximity to releasing facilities):

- Distribution in commerce;
- Industrial use – functional fluids (closed systems) – heat transferring agent;
- Commercial use – plastic and rubber products;
- Commercial use – fuels and related products; and
- Consumer use – plastic and rubber products.

Based on the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l), the Agency has considered the risk (*i.e.*, human health and environmental risks related to exposures to byproducts) and is concluding that, based on the reasonably available information, the risk identified in the draft byproducts assessment is *not* expected to change any of the conclusions of this preliminary risk determination.

Next Steps and Public Comment

This draft risk evaluation and the accompanying technical support documents (TSDs) and supplemental files (see Appendix C) have been released for public comment. Although EPA seeks public comment on all aspects of this draft risk evaluation package, the Agency particularly seeks comment on the following:

1. The approach taken to evaluate byproducts in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l);

2. The COU name and description for "Industrial use – other use – process solvent"—particularly whether there is overlap between this use as a process solvent in chemical reactions (including a proprietary use in pesticide, fertilizer, and other agricultural chemical manufacturing) and other processing or industrial and commercial COUs that may duplicate this newly added COU (see Appendix D); for example, Processing – incorporated into a formulation, mixture, reaction product;
3. Whether the delineation of occupational exposure scenarios (OESs) associated with the Disposal COU are clear and accurate;
4. Whether and how exposure controls and personal protective equipment (PPE) are used during the manufacture, processing, and use of 1,2-dichloroethane for each of the COUs. Although EPA has test order data, additional information on when and where exposure controls and PPE are used would be informative;
5. All aspects of the approach for assessing ambient air inhalation exposure for the general population, including exposure input assumptions, uncertainties, as well as the calculation and interpretation of additional cancer cases based on the population exposed;
6. Information on environmental releases for OESs for which releases were modeled (Repackaging, Application of adhesives and sealants, Industrial and commercial non-aerosol cleaning/degreasing, Application of lubricants and greases, Industrial and commercial aerosol products, and Laboratory use); and
7. Information on OESs for which EPA has slight confidence on exposures to workers and/or ONUs (Repackaging, Industrial and commercial aerosol products, and Waste handling, treatment, and disposal [landfills]), including on the degree to which 1,2-dichloroethane is used in industrial and commercial aerosol products.

Public comments on the draft risk evaluation, TSDs, and supplemental files—as well public and SACC feedback on the previously released *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b)—will inform the final risk evaluation of 1,2-dichloroethane, including the Agency final determination of whether 1,2-dichloroethane presents unreasonable risk to human health or the environment under the COUs. If in the final risk evaluation, the Agency determines that 1,2-dichloroethane presents unreasonable risk to human health or the environment, EPA will initiate regulatory action under TSCA section 6(a) to the extent necessary so that 1,2-dichloroethane no longer presents such risk.

1 INTRODUCTION

EPA has evaluated 1,2-dichloroethane (CASRN 107-06-2), also known as ethylene dichloride, pursuant to section 6(b) of the Toxic Substances Control Act (TSCA). 1,2-Dichloroethane is used primarily in the synthesis of vinyl chloride—over 90 percent of produced 1,2-dichloroethane is converted to vinyl chloride (EPA-HQ-OPPT-2018-0427-0040). Section 1.1 summarizes the scope of this draft 1,2-dichloroethane risk evaluation and provides information on production volume and a life cycle diagram (LCD). Section 1.2 provides the conditions of use (COUs) under TSCA, conceptual models used for 1,2-dichloroethane, and populations and durations of exposure assessed. Section 1.3 includes an overview of the systematic review process and Section 1.4 presents the organization of this draft risk evaluation.

Figure 1-1 describes the major inputs, phases, and outputs/components of the TSCA risk evaluation process, from scoping to releasing the final risk evaluation.

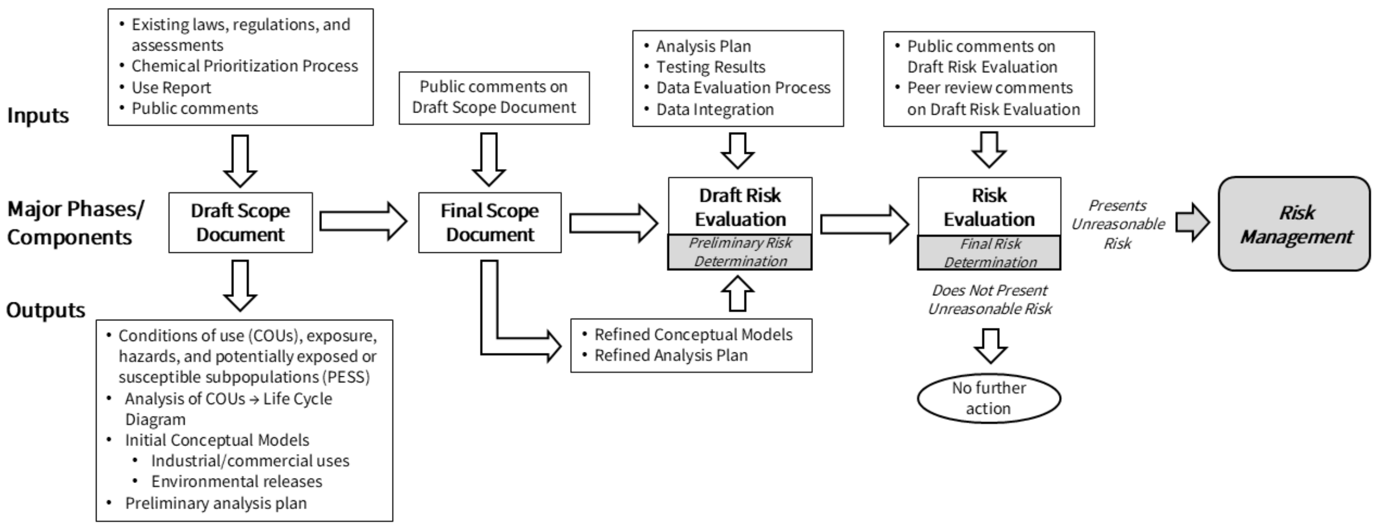

Figure 1-1. TSCA Existing Chemical Risk Evaluation Process

1.1 Scope of the Risk Evaluation

EPA evaluated risk to human and environmental populations for 1,2-dichloroethane. Specifically, for human populations, the Agency evaluated risk to (1) workers and occupational non-users (ONUs) via inhalation and workers via dermal routes; (2) consumers via inhalation, dermal, and oral routes; and (3) the general population, including potentially exposed or susceptible subpopulations (PESS; infants exposed to drinking water during formula bottle feeding, subsistence and Tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and fenceline communities) via oral, dermal, and inhalation routes. For environmental populations, EPA evaluated risk to aquatic species via surface water and sediment and to terrestrial species via air (deposition to soil), surface water, sediment, and soil pathways leading to dietary and direct ingestion exposure.

The draft 1,2-dichloroethane risk evaluation comprises a series of technical support documents (TSDs) and supplemental files. Each TSD contains an assessment with sub-assessments that inform adjacent, "downstream" TSDs. A basic diagram showing the layout and relationship of these draft assessments to the draft risk evaluation is provided below in Figure 1-2. High-level summaries of each relevant TSD are presented in this draft risk evaluation. Detailed information for each TSD can be found in the corresponding documents. Appendix C incudes a list and citations for all TSDs and supplemental files included in the draft risk evaluation for 1,2-dichloroethane.

The TSDs leveraged the data and information sources already identified in *Final Scope of the Risk Evaluation for 1,2-Dichloroethane; CASRN 107-06-2* (also called the "final scope document" or "final scope") ([U.S. EPA, 2020c](#)). EPA's OPPT conducted a comprehensive search for reasonably available information to identify relevant 1,2-dichloroethane data for use in this draft risk evaluation as required by TSCA. The approach used to identify specific relevant risk assessment information was discipline-specific and is detailed in the *Draft Risk Evaluation for 1,2-Dichloroethane – Systematic Review Protocol* ([U.S. EPA, 2025bd](#)), or as otherwise noted in relevant TSDs.

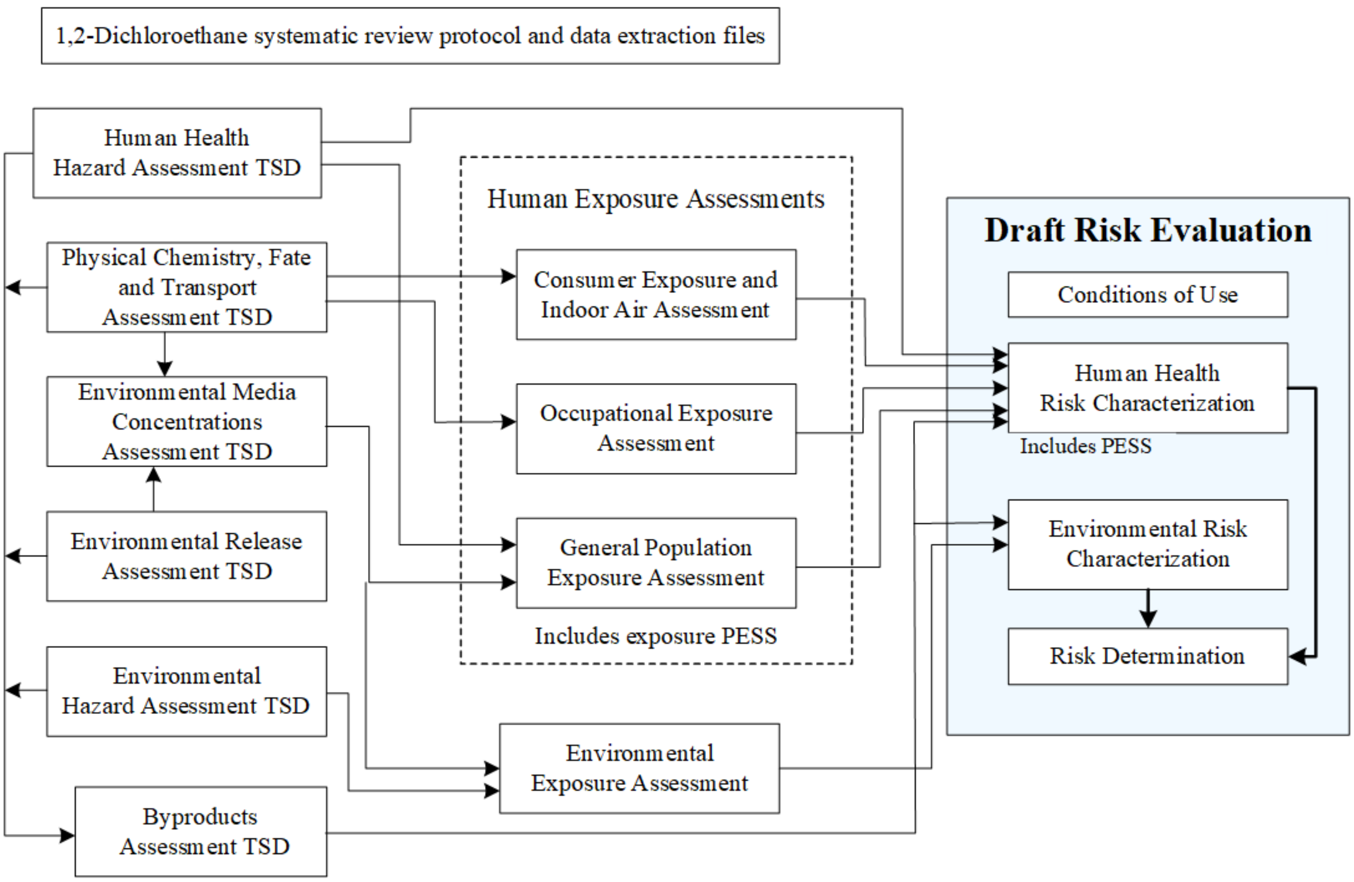

Figure 1-2. Draft Risk Evaluation for 1,2-Dichloroethane Document Summary Map

1.1.1 Life Cycle and Production Volume

The LCD for 1,2-dichloroethane (see Figure 1-3) depicts the COUs assessed in this draft risk evaluation during various life cycle stages, including manufacturing, processing, distribution, use (industrial, commercial, and consumer), and disposal. The 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 requires U.S. manufacturers (including importers) to provide EPA with information on the chemicals they manufacture or import into the United States. The Agency collects CDR data approximately every 4 years with the latest collections occurring in 2006, 2012, 2016, 2020, and 2024.

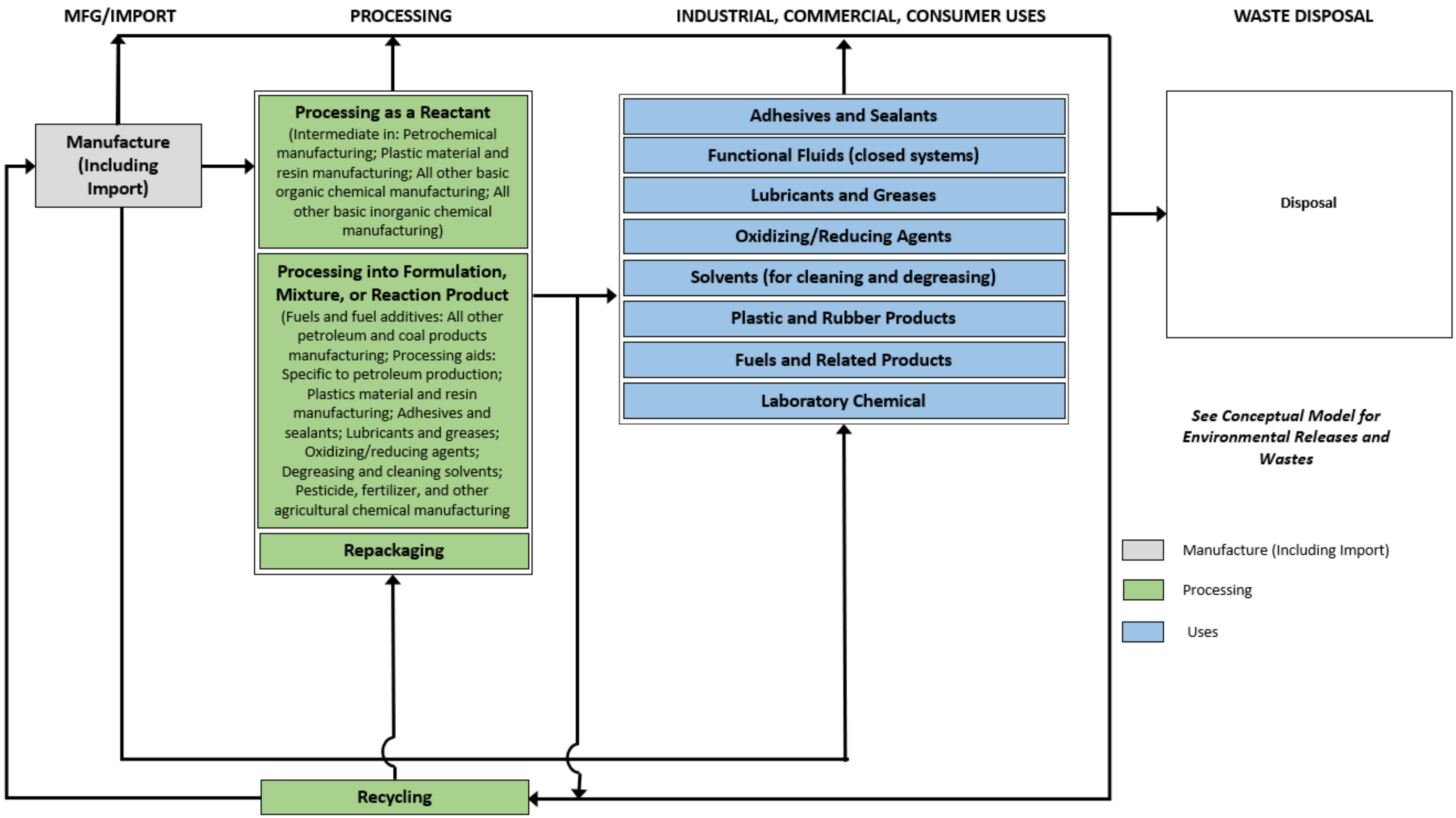

Figure 1-3. 1,2-Dichloroethane Life Cycle Diagram

See Table 1-1 below for categories and subcategories of COUs. EPA considers the activities of loading and unloading of chemical product part of distribution in commerce; however, these activities were assessed as part of each COU's occupational exposure scenario (OES).

EPA included descriptions of the industrial, commercial, and consumer use categories identified from the 2020 CDR in the LCD (Figure 1-3) (U.S. EPA, 2020a). The descriptions provide a brief overview of the use category. The *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) and *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at) contain more detailed descriptions (*e.g.*, process descriptions, worker activities, process flow diagrams, equipment illustrations) for each manufacture, processing, use, and disposal category.

The manufacture of 1,2-dichloroethane has increased over the past 2 decades. The production volume for 1,2-dichloroethane in 2015 was between 20 and 30 billion pounds (lb), based on the 2016 CDR data. The range increased in the latest 2020 CDR data (the reported total production volume in 2019 was between 30–40 billion lb). Note that production volume is described herein as a range to protect production volumes that were claimed as confidential business information (CBI). For the 2016 and 2020 CDR cycles, collected data included the company name, volume of each chemical manufactured/imported, the number of workers at each site, and information on whether the chemical was used in the commercial, industrial, and/or consumer sector(s).

1.2 Conditions of Use Included in the Risk Evaluation

The final scope document ((U.S. EPA, 2020b)) 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 1,2-dichloroethane included in this draft risk evaluation are reflected in the LCD (Figure 1-3) and conceptual models provided in Section 1.2.1. Table 1-1 presents all COUs for 1,2-dichloroethane.

For this draft risk evaluation, EPA altered and added some COUs from those described in the final scope document (see also Appendix D): “All other basic inorganic chemical manufacturing” was added to “Processing, as a reactant, intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing” based on 2020 CDR reporting. “Plastics and resin manufacturing” was added to “Processing, incorporation into formulation, mixture, or reaction product – processing aids: specific to petroleum production” based on input from a stakeholder. “Processing, incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing” was inadvertently omitted from the final scope. The latter COU is needed to account for the upstream processing of such formulations that include 1,2-dichloroethane. “Paste lubricants and greases” was changed to “Solid film lubricants and greases” in response to input from stakeholders. “A component of degreasing and cleaning solvents” was changed to “Degreasing and cleaning solvents” for clarity.

EPA also removed one COU for the use of “Embalming fluid.” In Section 2.2.2 of the final scope document for 1,2-dichloroethane (U.S. EPA, 2020b), the Agency explained that “TSCA Section 3(2) also excludes from the definition of ‘chemical substance’ ‘any food, food additive, drug, cosmetic, or device (as such terms are defined in Section 201 of the Federal Food, Drug, and Cosmetic Act [21 U.S.C. 321]) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device’ as well as ‘any pesticide (as defined in the Federal Insecticide, Fungicide, and Rodenticide Act [7 U.S.C. 136 et seq.]) when manufactured, processed, or distributed in commerce for use as a pesticide.’” EPA has since determined that the commercial use of 1,2-dichloroethane in embalming fluid constitutes a non-TSCA use. The Agency notes that the processing of such an embalming fluid is addressed in the added COU “Processing – incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases, oxidizing/reducing agents, degreasing and cleaning solvents; pesticides,” because “pesticides” encompasses embalming fluid.

A complete list of updates and explanations of the updates made to COUs for 1,2-dichloroethane from the final scope document to this draft risk evaluation is provided in Appendix D. EPA may further refine the COU descriptions for 1,2-dichloroethane included in this draft risk evaluation when the final risk evaluation is published based upon further outreach and public comments. Table 1-1 presents the revised COUs that were included and evaluated in this draft risk evaluation for 1,2-dichloroethane. Appendix E contains summary descriptions of each COU.

Table 1-1. Conditions of Use in the Draft Risk Evaluation for 1,2-Dichloroethane

Conditions of Use			Reference(s)
Life Cycle Stage [a]	**Category [b]**	**Subcategory [c]**	
Manufacturing	Domestic manufacture [d]	Domestic manufacture	2012, 2016, 2020 CDR Data
	Import	Import	2012, 2016, 2020 CDR Data
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	2012, 2016, 2020 CDR Data; EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0015; EPA-HQ-OPPT-2018-0427-0065
	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing	2012, 2016, 2020 CDR Data; EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0015
		Processing aids: specific to petroleum production; plastics material and resin manufacturing	2012, 2016, 2020 CDR Data; EPA-HQ-OPPT-2018-0427-0065
		Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	2012, 2016, 2020 CDR Data; (Frigid Fluid Company, 2015)
	Repackaging	Repackaging	
	Recycling	Recycling	2012, 2016, 2020 CDR Data
Distribution in Commerce	Distribution in commerce	Distribution in commerce	
Industrial Use	Adhesives and sealants	Adhesives and sealants	EPA-HQ-OPPT-2018-0427-0018
	Functional fluids (closed systems)	Heat transferring agent	(Baldwin Filters, 2015)
	Lubricants and greases	Solid film lubricants and greases	EPA-HQ-OPPT-2018-0427-0005
	Other use	Process solvent	BASF's 2022 TRI reporting at their Palmyra site
	Process regulator	*e.g.*, Catalyst moderator; oxidation inhibitor	EPA-HQ-OPPT-2018-0427-0006; EPA-HQ-OPPT-2018-0427-0067
	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	EPA-HQ-OPPT-2018-0427-0005
Commercial Use	Plastic and rubber products	Products such as: plastic and rubber products	2012, 2016, 2020 CDR Data
	Fuels and related products	Fuels and related products	2012, 2016, 2020 CDR Data; ; EPA-HQ-OPPT-2018-0427-0006
	Other use	Laboratory chemical	(Thermo Fisher, 2012)
Consumer Use	Plastic and rubber products	Plastic and rubber products	EPA-HQ-OAR-2002-0037-0203; EPA-HQ-OPPT-2018-0427-0040; (Doucette et al., 2010)

Conditions of Use			Reference(s)
Life Cycle Stage [a]	Category [b]	Subcategory [c]	
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 COUs appear in the LCD reflect CDR codes and broadly represent COUs of 1,2-dichloroethane in industrial and/or commercial settings.

[c] These subcategories reflect more specific COUs of 1,2-dichloroethane.

[d] During the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane (CASRN 75-34-3), trichloroethylene (CASRN 79-01-6), perchloroethylene (CASRN 127-18-4), methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5) are formed, and are assessed in this draft risk evaluation. The risk evaluation does not include the manufacture of 1,1,2-trichloroethane (CASRN 79-00-5) and *trans*-1,2-dichloroethylene (CASRN 156-60-5) as byproducts during the manufacture of 1,2-dichloroethane. Those exposures will be assessed in the risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene, respectively. See also *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

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 1,2-dichloroethane. There is potential for exposures to workers via inhalation and dermal contact. There is also potential for exposures to ONUs via inhalation contact only, because they are not expected to directly handle 1,2-dichloroethane. Although EPA considers the activities of loading and unloading of chemical product part of distribution in commerce, these activities were assessed as part of each COU's OES (Table 3-2). The Agency's current approach for quantitively assessing releases and exposures for the remaining aspects of distribution in commerce consists of searching U.S. Department of Transportation (DOT) and National Response Center (NRC) data for incident reports pertaining to 1,2-dichloroethane distribution.

Figure 1-5 presents the conceptual model for 1,2-dichloroethane exposure pathways, exposure routes, and hazards due to consumer activities and uses. Figure 1-6 presents general population exposure pathways, exposure routes, and hazards for environmental releases and wastes, whereas Figure 1-7 presents the conceptual model for ecological exposures and hazards from environmental releases and wastes.

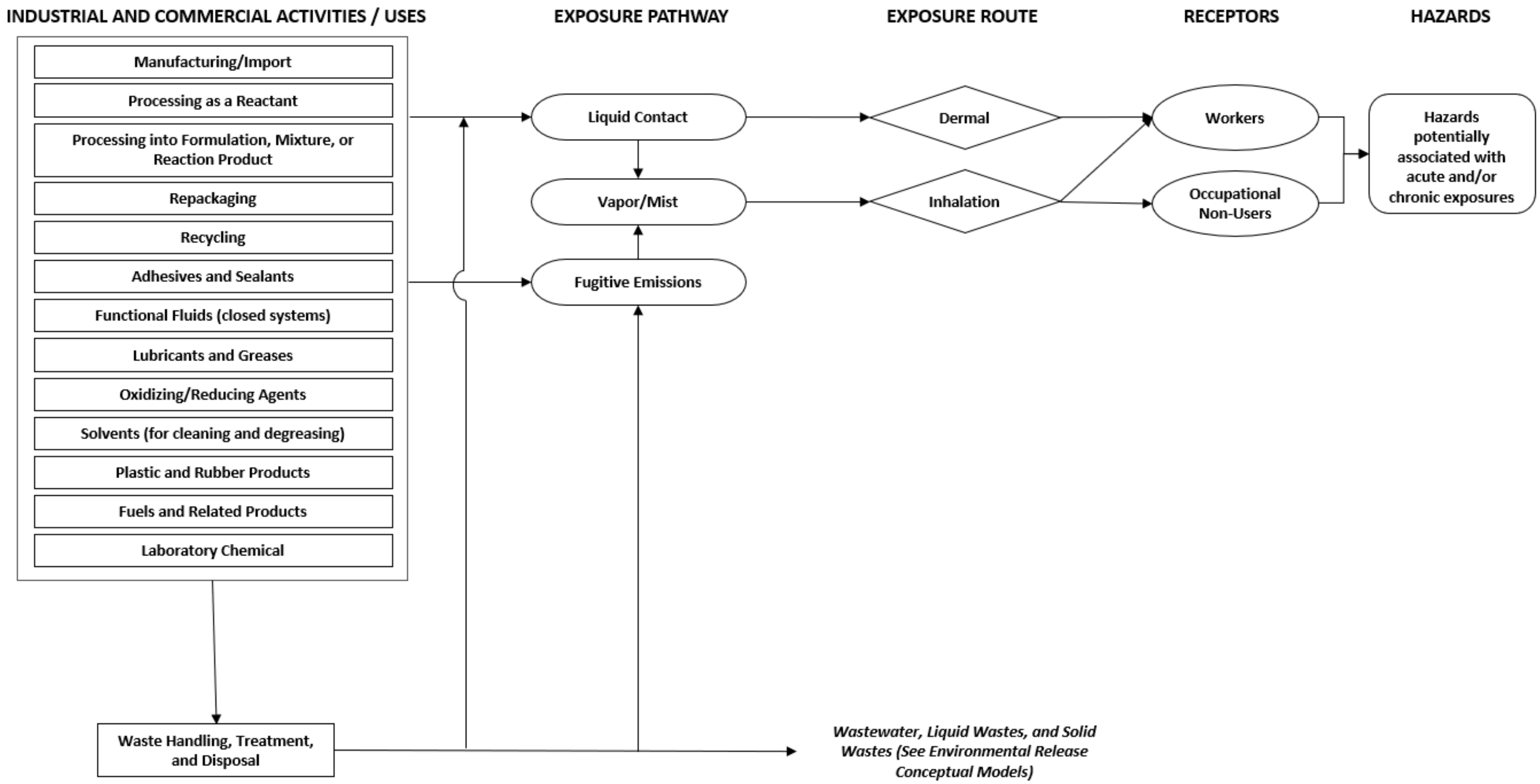

Figure 1-4. 1,2-Dichloroethane Conceptual Model for Industrial and Commercial Activities and Uses: Potential Exposure and Hazards

See Table 1-1 for categories and subcategories of COUs.

Notes: Fugitive air emissions are not routed through a stack 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.

Exposure can occur through mists that deposit in the upper respiratory tract; however, based on its physical and chemical properties, mists of 1,2-dichloroethane will likely be rapidly absorbed in the respiratory tract or evaporate and were evaluated as an inhalation exposure.

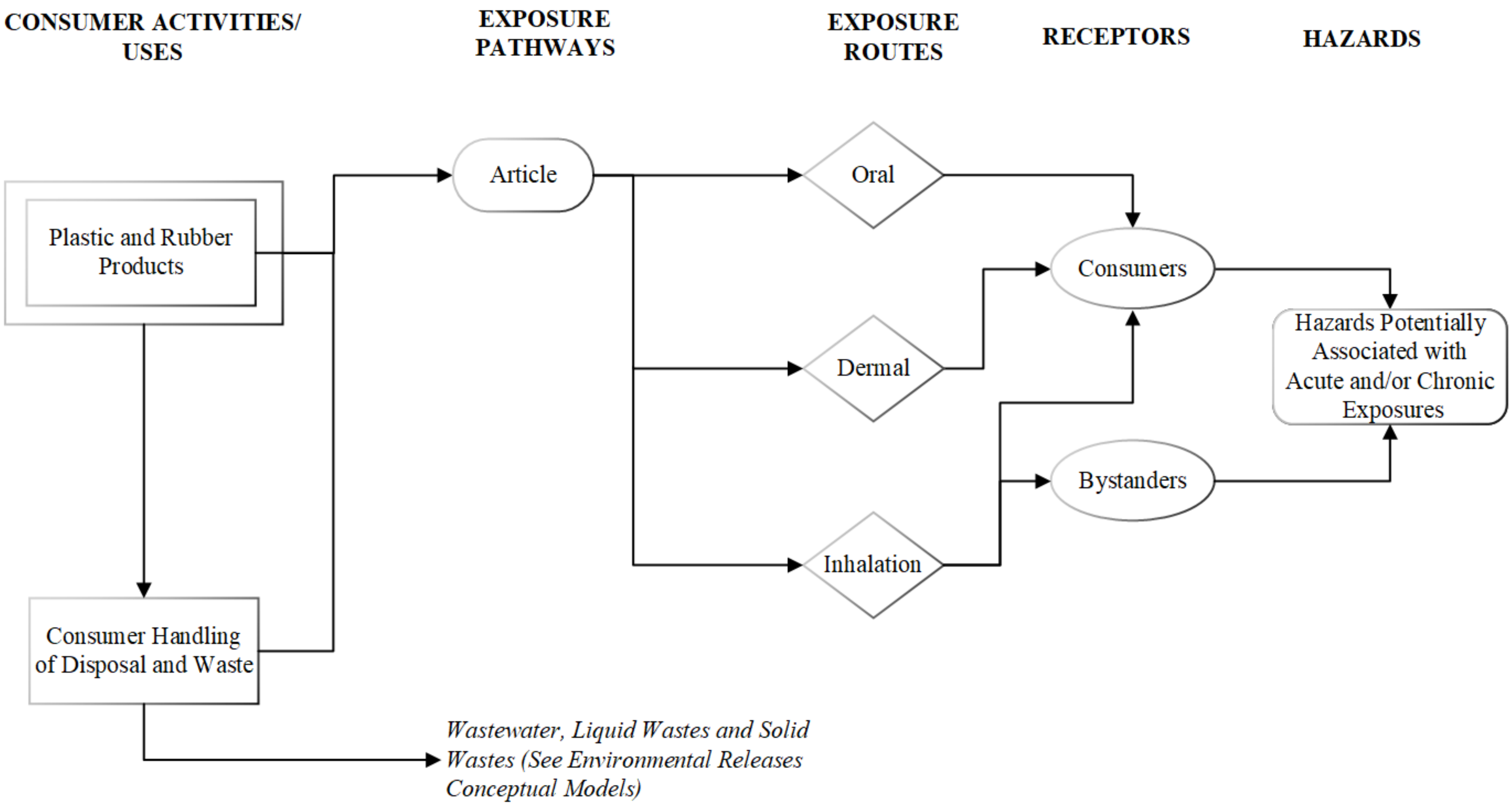

Figure 1-5. 1,2-Dichloroethane Conceptual Model for Consumer Articles: Consumer Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from consumer activities and uses of 1,2-dichloroethane.

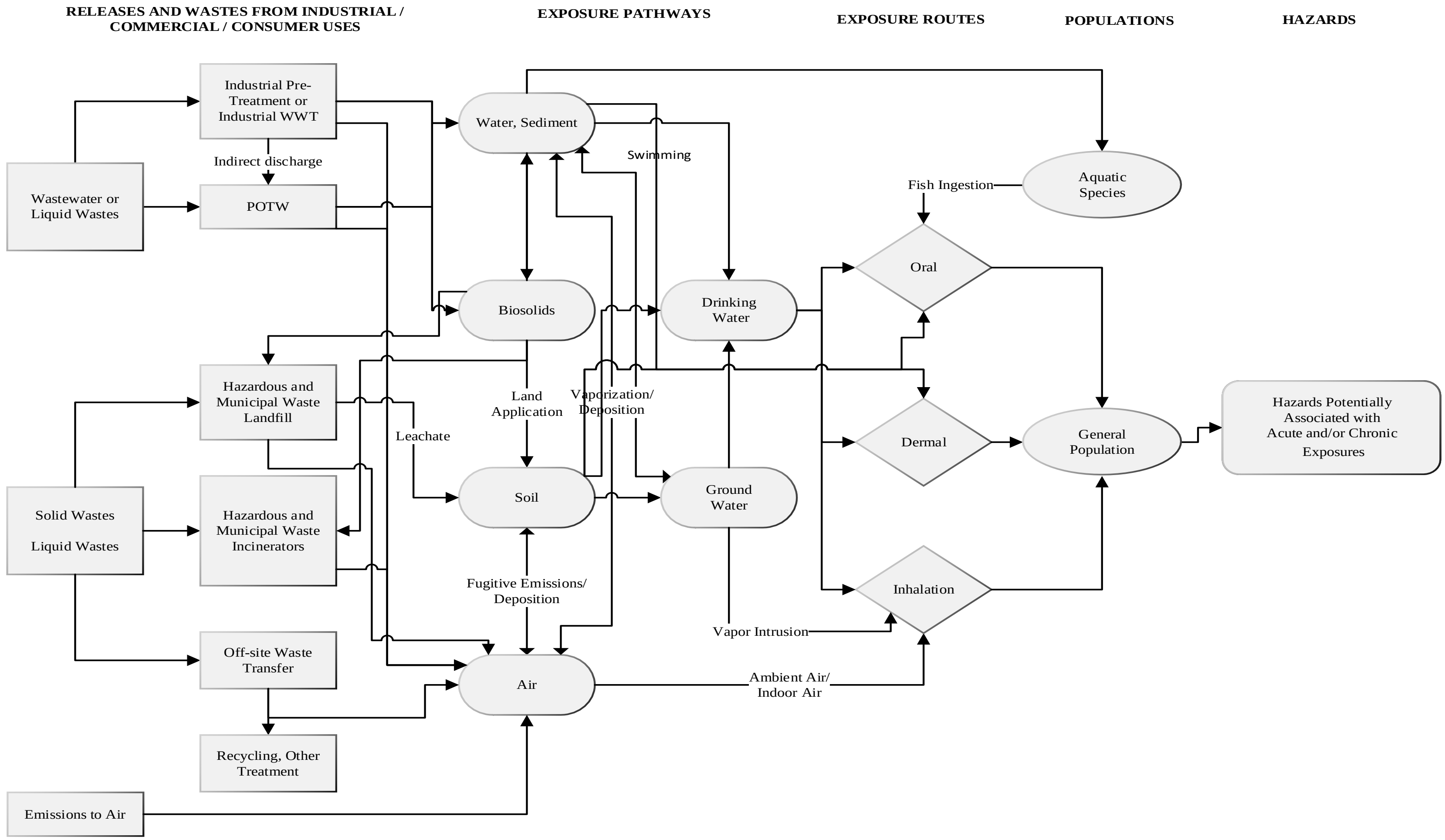

Figure 1-6. 1,2-Dichloroethane Conceptual Model for Environmental Releases and Wastes: General Population Exposures and Hazards

The conceptual model presents the exposure pathways, exposure routes, and hazards to human populations from releases and wastes from industrial, commercial, and consumer uses of 1,2-dichloroethane.

Notes: Industrial wastewater or liquid wastes may be treated on-site and then released to surface water (direct discharges) or pre-treated and released to a publicly owned treatment works (POTW) (indirect discharges). General population includes persons exposed to releases of 1,2-dichloroethane, including PESS such as infants exposed to drinking water from public drinking water treatment systems during formula bottle feeding; subsistence and Tribal fishers; men of reproductive age; individuals with preexisting conditions such as chronic kidney disease; people with the aldehyde dehydrogenase-2 polymorphism; lifestyle factors such as smoking cigarettes or secondhand smoke; and fenceline communities who live near facilities that release 1,2-dichloroethane.

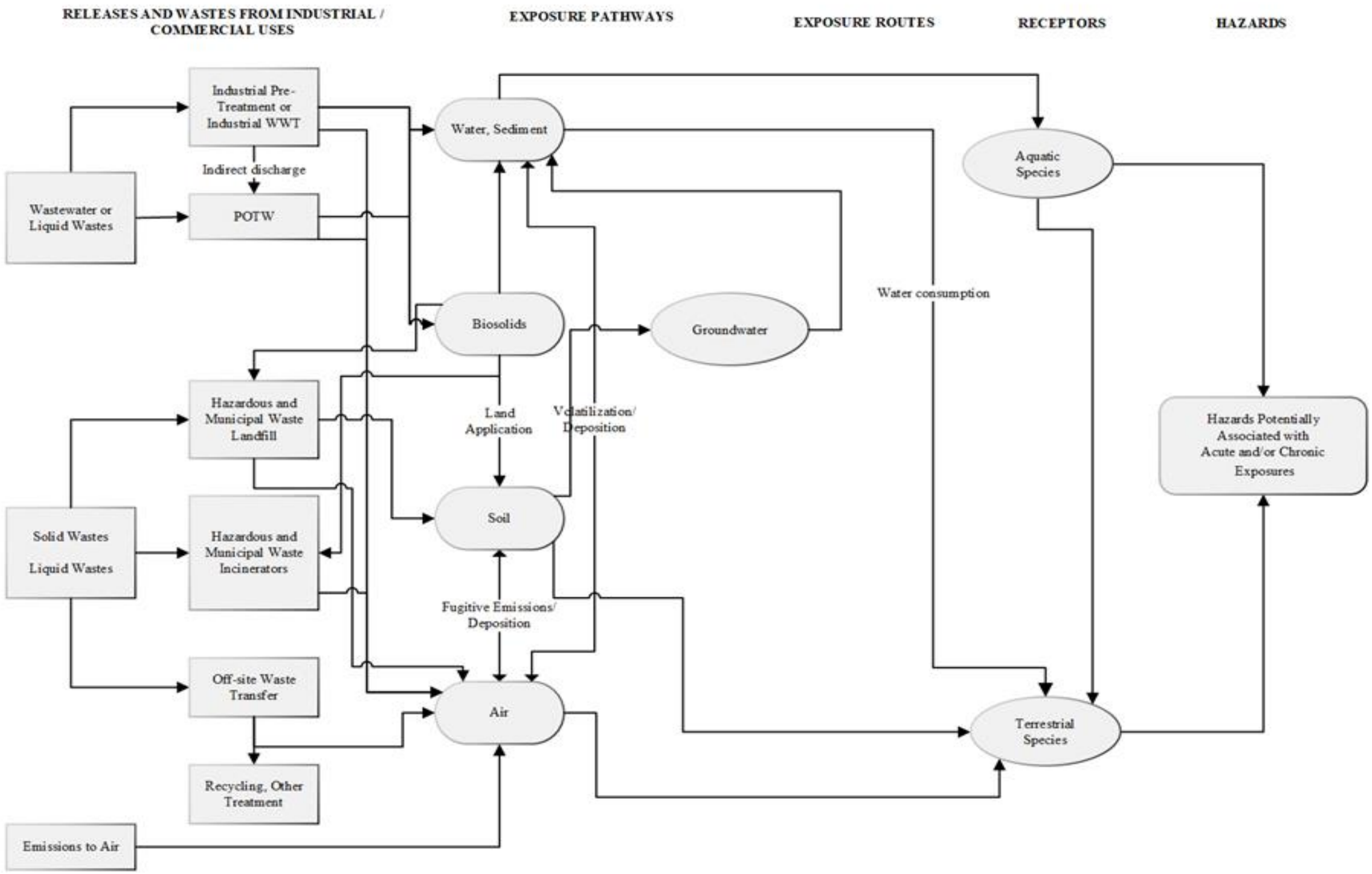

Figure 1-7. 1,2-Dichloroethane Conceptual Model for Environmental Releases and Wastes: Ecological Exposures and Hazards
The conceptual model presents the exposure pathways, exposure routes, and hazards to ecological populations from releases and wastes from industrial, commercial, and/or consumer uses of 1,2-dichloroethane.
Notes: Industrial wastewater or liquid wastes may be treated on-site and released to surface water (direct discharge) or pretreated and released to POTW (indirect discharge).

1.2.2 Populations and Durations of Exposures Assessed

Based on the conceptual models presented in Section 1.2.1, EPA evaluated risk to environmental and human populations. Environmental risks were evaluated for acute and chronic exposure scenarios for aquatic and terrestrial species, as appropriate. Human health risks were evaluated for acute, intermediate, chronic, and lifetime exposure scenarios, for (1) workers via inhalation and dermal exposure routes; (2) the general population via oral, dermal, and inhalation routes; and (3) consumer users via oral, dermal, and inhalation routes as well as bystanders via only the inhalation route.

1.2.2.1 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 non-risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation 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 Subpopulations]…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 draft risk evaluation considers PESS throughout the human health risk assessment, including throughout the exposure assessment, hazard identification, dose-response analysis, and as summarized in the hazard characterization (see Section 5.3.2). Evaluation of the qualitative and quantitative evidence for PESS begins as part of the systematic review process (Section 1.3). Any available relevant published studies and other data are identified from a broad literature search strategy across several databases and focused only on the chemical name (including synonyms and trade names) with no additional search limits. This broad search process is described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances: A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also referred to as "2021 Draft Systematic Review Protocol"; see Section 1.3) (U.S. EPA, 2021). When adequate and complete, evidence related to PESS informs the derivation of exposure estimates and human health hazard endpoints/values that are protective of those PESS.

PESS factors can influence the selection of relevant exposure pathways, the sensitivity of derived hazard values, the identification of human subpopulations, and the discussion of uncertainties throughout the assessment. In this draft risk evaluation, EPA integrated and assessed available information on hazards and exposures for the COUs of 1,2-dichloroethane, including information relevant to specific risks of injury to PESS. In addition to workers, PESS identified as relevant include infants exposed to drinking water during formula bottle feeding, subsistence and Tribal fishers, men of reproductive age, people with the aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane (Section 5.3.2).

1.3 Systematic Review

EPA applies systematic review principles in the development of risk evaluations under the amended TSCA. Section 26(h) of TSCA requires EPA to use scientific information, technical procedures, measures, methods, protocols, methodologies, and models consistent with the best available science and base decisions under section 6 on the weight of scientific evidence.

To meet the TSCA section 26(h) science standards, EPA used the TSCA systematic review process described in the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and the *Draft Risk Evaluation for 1,2-Dichloroethane – Systematic Review Protocol* (U.S. EPA, 2025bd) (also called the "1,2-Dichloroethane Systematic Review Protocol"). Systematic review supports the risk evaluation in that data searching, screening, evaluation, extraction, and evidence integration are used to develop the exposure and hazard assessments based on reasonably available information. EPA defines "reasonably available information" to mean information that the Agency possesses or can reasonably obtain and synthesize for use in risk evaluations, considering the deadlines for completing the evaluation (40 CFR 702.33).

The systematic review process is illustrated in Figure 1-8. More details regarding these steps are provided in the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and the 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2025bd). The latter provides additional information on the steps in the systematic review process—including literature inventory trees and evidence maps for each discipline (*e.g.*, human health hazard) containing results of the literature search and screening as well as sections summarizing data evaluation, extraction, and evidence integration.

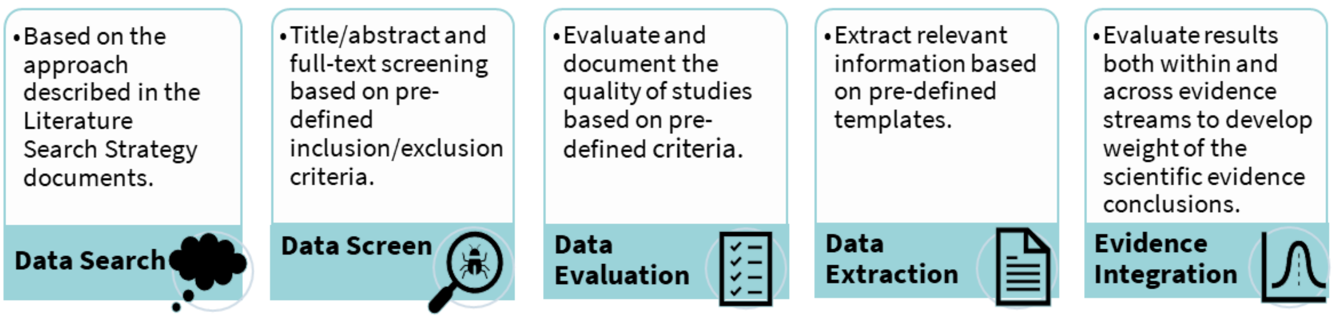

Figure 1-8. Diagram of the Systematic Review Process

EPA reviewed reasonably available information, defined in 40 CFR 702.33, in a fit-for-purpose approach, to develop a risk evaluation that relies on the best available science and is based on the weight of scientific evidence in accordance with TSCA sections 6 and 26. The Agency reviewed reasonably available information and evaluated the quality of the methods and reporting of results of the individual studies using the evaluation strategies described in the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and the 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2025bd).

EPA also identified key assessments conducted by other Agency programs and other U.S. and international organizations. Depending on the source, these assessments may include information on COUs (or the equivalent), hazards, exposures, and PESS. Some of the most pertinent assessments that were consulted for this 1,2-dichloroethane draft risk evaluation include the following:

- California Environmental Protection Agency, OEHHA 1999 *Public Health Goals for 1,2-Dichloroethane in Drinking Water* and 2005 update memorandum (accessed June 16, 2025);
- U.S. Department of Human Health Services, Public Health Service, ATSDR 2024 *Toxicological Profile for 1,2-Dichloroethane* (accessed June 16, 2025) (also called "2024 ATSDR Tox Profile");
- U.S. EPA Integrated Risk Information System (IRIS) Chemical Assessment 1987 *1,2-Dichloroethane; CASRN 107-06-2* (accessed June 16, 2025); and
- U.S. EPA 2010 *Provisional Peer Reviewed Toxicity Values for 1,2-Dichloroethane; CASRN 107-06-2* (accessed June 16, 2025).

1.4 Organization of the Draft Risk Evaluation

This draft risk evaluation for 1,2-dichloroethane includes the following additional major sections and several appendices:

- Section 2 summarizes basic physical and chemical characteristics as well as the fate and transport of 1,2-dichloroethane.
- Section 3 includes an overview of releases and concentrations of 1,2-dichloroethane in the environment.
- Section 4 provides a discussion and analysis of the environmental risk assessment, including the environmental exposure, hazard, and risk characterization based on the COUs for 1,2-dichloroethane. It also discusses assumptions and uncertainties and how they impact EPA's overall confidence in risk estimates.
- Section 5 presents the human health risk assessment, including the exposure, hazard, and risk characterization based on the COUs for 1,2-dichloroethane. It also includes a discussion of PESS based on both greater exposure and susceptibility as well as a description of aggregate and sentinel exposures. Section 5 also discusses assumptions and uncertainties and how they impact EPA's overall confidence in risk estimates.
- Section 6 presents EPA's proposed determination of whether 1,2-dichloroethane 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 draft risk evaluation. Appendix B provides a summary of the federal, state, and international regulatory history of 1,2-dichloroethane. Appendix C incudes a list and citations for all TSDs and supplemental files included in the draft risk evaluation for 1,2-dichloroethane, which can be accessed through hyperlinks included in the references. Appendix D provides a summary of updates made to COUs for 1,2-dichloroethane from the final scope document to this draft risk evaluation. Appendix E provides descriptions of all 1,2-dichloroethane COUs evaluated by EPA. Appendix F provides the draft occupational exposure value for 1,2-dichloroethane that was derived by the Agency. Appendix G and Appendix H provide general population, non-cancer, ambient air inhalation risk tables for acute and chronic exposures, respectively. Appendix I provides a summary of 1,2-dichloroethane air sampling from a TSCA section 4 test order. Lastly, Appendix J provides additional sources of information on PPE.

2 CHEMISTRY AND FATE AND TRANSPORT OF 1,2-DICHLOROETHANE

Physical and chemical properties determine the behavior and characteristics of a chemical that inform its conditions of use, 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 1,2-dichloroethane informs the specific exposure pathways and potential human and environmental exposed populations that EPA considered in this draft risk evaluation.

In general, under normal environmental conditions 1,2-dichloroethane is an oily liquid that (1) is expected to volatilize from water, (2) has low bioaccumulation potential in aquatic and terrestrial organisms, and (3) is considered to have limited biodegradability 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 1,2-dichloroethane, respectively. See the *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p) for additional 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 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2025bd). The Agency considered both measured and estimated physical and chemical property data/information as described in the *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p). The selected values are summarized below in Table 2-1, as applicable. Information on the full, extracted dataset is available in the *Draft Risk Evaluation for 1,2-Dichloroethane – Systematic Review Supplemental File: Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport* (U.S. EPA, 2025u).

Table 2-1. Physical and Chemical Properties of 1,2-Dichloroethane[a]

Property	Selected Value(s)	Reference(s)	Overall Data Quality Determination
Molecular formula	$C_2H_4Cl_2$	N/A	N/A
Molecular weight	98.95 g/mol	N/A	N/A
Physical form	Colorless oily liquid with a chloroform-like odor	HSDB (2018), NCBI (2020a)	High
Melting point	−35.61 °C	Rumble (2018a)	High
Boiling point	83.43 °C	Rumble (2018a)	High
Density	1.24529 at 25 °C	Rumble (2018a)	High
Vapor pressure	78.9 mmHg at 25 °C	HSDB (2018)	High
Vapor density	3.4 (air = 1 g/cm^3)	NCBI (2020b)	High
Water solubility	8,600 mg/L at 25 °C	Rumble (2018b)	High
Octanol/water partition coefficient (log K_{ow})	1.48 at 25 °C	Elsevier (2019b)	High
Henry's Law constant	0.00154 atm m^3/mol at 25 °C	NIST (2022)	High
Flash point	13 °C	O'Neil (2013)	High
Autoflammability	413 °C	Rumble (2018c)	High
Viscosity	0.779 cP at 25 °C	Rumble (2018d)	High

Property	Selected Value(s)	Reference(s)	Overall Data Quality Determination
Refractive index	1.4539 at 25 °C	Elsevier (2019a)	High
Dielectric constant	10.13 at 25 °C	Elsevier (2019a)	High
[a] Additional information on value selection can be found in the *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p).			

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 partition coefficients—are parameters used in this draft risk evaluation. In assessing the environmental fate and transport of 1,2-dichloroethane, EPA considered the full range of results from the available high-quality data sources obtained during systematic review. Information on the full, extracted dataset is available in the supplemental file *Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport Studies for 1,2-Dichloroethane* (U.S. EPA, 2025u) and *Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for 1,2-Dichloroethane* (U.S. EPA, 2025w).

The Agency evaluated the reasonably available information to characterize the environmental fate and transport of 1,2-dichloroethane. The key points of the fate assessment for 1,2-dichloroethane (U.S. EPA, 2025, 11816713) are summarized below and listed in Table 2-2.

Given the consistent results from numerous high-quality studies discussed in the *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p), there is robust evidence of the following:

- 1,2-Dichloroethane is not expected to undergo significant direct photolysis but will undergo indirect photodegradation by reacting slowly with hydroxyl radicals (·OH) in the atmosphere with a half-life of 42 to 51 days.
- 1,2-Dichloroethane is expected to hydrolyze very slowly in water.
- 1,2-Dichloroethane is not expected to biodegrade in surface water or sediments under aerobic conditions.
- Under certain conditions, 1,2-dichloroethane may biodegrade rapidly.
  - Those conditions include groundwater under aerobic or nitrate-reducing conditions and with previous exposure to 1,2-dichloroethane, appropriate microbes, and/or in the presence of nutrients and supplemental substrates such as acetate, toluene, or benzene.
- 1,2-Dichloroethane is not expected to sorb to soil/sediment particles and therefore has the potential to reach groundwater.
- 1,2-Dichloroethane is not expected to partition to organic matter in the air and therefore will not undergo dry or wet deposition.
- 1,2-Dichloroethane is expected to have low bioaccumulation potential in aquatic and terrestrial organisms.
- 1,2-Dichloroethane is expected to be removed during wastewater treatment processes, mainly through volatilization.
  - Although the concentrations of 1,2-dichloroethane are likely to be low in biosolids due to volatilization during the treatment process, uncertainty remains regarding the concentrations in biosolids that could be land applied due to a lack of monitoring data.

As a result of limited studies identified, there is moderate evidence of the following:

- 1,2-Dichloroethane is expected to undergo long-range transport in air due to its slow photodegradation rate in air.
- 1,2-Dichloroethane is expected to biodegrade rapidly in soils.
- Except under specific circumstances, 1,2-dichloroethane is expected to generally biodegrade slowly under reducing conditions in groundwater.
- 1,2-Dichloroethane is expected to enter groundwater from unlined or improperly managed landfills.
- 1,2-Dichloroethane is expected to have low removal rates from conventional drinking water treatment systems but may be highly removed by advanced treatment technologies (*e.g.*, low profile aeration).

Conclusions that were determined to have a robust weight of evidence supporting them had two or more high-quality studies that were largely in agreement with each other. Conclusions that were determined to have a moderate weight of evidence were based on less than two high-quality studies or two high-quality studies that varied in consistency of findings. The studies were supported by physical-chemical and fate properties and/or model outputs, where applicable.

Table 2-2. Summary of Environmental Fate Information for 1,2-Dichloroethane[a]

Property or Endpoint	Value[b]	Reference(s)	Overall Data Quality Determination
Indirect photodegradation	k_{OH} = 2.09 to 2.54E−13 cm^3/mol-s, 42 to 51-day half-life (assuming 12-hour day, 1.5E06 ·OH/cm^3)	Taylor et al. (1991), Qiu et al. (1992)	High
Hydrolysis half-life	6.1–72 years half-life	Barbash Je (1989), Jeffers et al. (1989)	High
Biodegradation in groundwater Aerobic conditions	0.8–9 days half-life	Cox et al. (2000), Cox et al. (1998)	High, Medium
Biodegradation in groundwater Nitrate reducing conditions	1–10 days half-life	Cox et al. (2000), Gerritse et al. (1999)	High
Biodegradation in groundwater Reducing conditions	33–843 days half-life	Huff et al. (2000); Henderson et al. (2007); Cox et al. (2000)	High
	58–11,242 days half-life	Lee et al. (1999); Ravi et al. (1998); Nobre and Nobre (2004); Bosma et al. (1998); Mayer (2006)	Medium
Biodegradation in river water or wetland sediments Aerobic conditions	No degradation detected in 4.5 days and 12 months	Mudder (1981), van der Zaan et al. (2009)	High

Property or Endpoint	Value[b]	Reference(s)	Overall Data Quality Determination
Biodegradation in river water or wetland sediments Reducing conditions	No degradation detected in 12 months	van der Zaan et al. (2009)	High
Biodegradation in river water or wetland microcosms Reducing conditions	6–51.5 days half-life	van der Zaan et al. (2009), Peijnenburg et al. (1998), Jafvert and Lee Wolfe (1987)	High
Biodegradation in soil Aerobic conditions	6 to >28 days half-life	Watwood et al. (1991), Olaniran et al. (2011)	High
Biodegradation in soil Anaerobic conditions	>28 days half-life	Watwood et al. (1991)	High
Bioconcentration factor (BCF)	2–4.4[c] L/kg	Barrows et al. (1980), OECD (2002), U.S. EPA (2012b)	High
Bioaccumulation factor (BAF)	3.78 L/kg [c]	U.S. EPA (2012b)	High
Soil organic carbon:water partition coefficient (Log K_{OC})	1.3–1.77	Valsaraj et al. (1999), Wilson et al. (1981), Wefer-Roehl et al. (2001)	High
Octanol:air partition coefficient (Log K_{OA})	2.7± 0.2 at 25 °C	Lei et al. (2019)	High
Air:water partition coefficient (Log K_{AW})	−1.201[c]	U.S. EPA (2012b)	High
Removal in wastewater treatment	33–100% removal efficiency	O'Brien (1992), Kincannon et al. (1983), Roy F. Weston Inc (1980), U.S. EPA (1982)	High

[a] Additional information on value selection can be found in the *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p).
[b] Measured unless otherwise noted.
[c] Information was estimated using EPI Suite™ (U.S. EPA, 2012b).

3 RELEASES AND CONCENTRATIONS OF 1,2-DICHLOROETHANE IN THE ENVIRONMENT

EPA estimated environmental releases and concentrations of 1,2-dichloroethane. Section 3.1 describes the approach and methodology for estimating releases; Section 3.2 presents estimates of environmental releases and an evaluation of the weight of scientific evidence for the environmental releases; and Section 3.3 presents the approach and methodology for estimating environmental concentrations, a summary of concentrations of 1,2-dichloroethane in the environment, as well as an evaluation of the weight of scientific evidence for the environmental concentrations.

3.1 Approach and Methodology

This section provides an overview of the approach and methodology for assessing releases of 1,2-dichloroethane to the environment from manufacture, processing, industrial, and commercial uses.

3.1.1 Manufacturing, Processing, Industrial and Commercial Uses

This subsection describes the grouping of manufacturing, processing, industrial, and commercial COUs into OESs as well as the use of 1,2-dichloroethane within each OES. Specifically, Section 3.1.1.1 provides a crosswalk of COUs to OESs and Section 3.1.1.2 provides descriptions for the function of 1,2-dichloroethane within each OES.

3.1.1.1 Crosswalk of Conditions of Use to Occupational Exposure Scenarios

EPA identified OESs to assess for each of the COUs listed in Table 1-1. Table 3-1 provides a crosswalk between the COUs and OESs whereas Table 3-4 provides the reverse—a crosswalk of OESs to COUs. The term "OES" is intended to describe the grouping of COUs for assessment of releases and occupational exposures as described in detail in Section 1.2 of the *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at). OESs are developed based on data that EPA has collected on the COUs. EPA may assess a group of multiple COUs together as one OES due to similarities in exposure and release potential. Alternatively, EPA may assess multiple OES for one COU because there are different release and exposure potentials within a given COU. For each OES, EPA estimated occupational exposure and environmental releases based on available data and modeling approaches. The *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) and *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at) provide further information on OESs.

Table 3-1. Crosswalk of Conditions of Use (COUs) to Assessed Occupational Exposure Scenarios (OESs) for 1,2-Dichloroethane

COU			OES
Life Cycle Stage[a]	**Category**[b]	**Subcategory**[c]	
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing[d]
			Manufacturing as an unintended byproduct
	Import	Import	Repackaging
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant
Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product
		Processing aids: specific to petroleum production	Processing into formulation, mixture, or reaction product
		Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into formulation, mixture, or reaction product
	Repackaging	Repackaging	Repackaging
	Recycling	Recycling	Processing as a reactant
Distribution in Commerce	Distribution in commerce	Distribution in commerce	Distribution in commerce[e]
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants
	Functional fluids (closed systems)	Heat transferring agent	Heat transferring agent[f]
	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases
	Process regulator	*e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant
	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Commercial aerosol products
			Non-aerosol cleaning and degreasing
	Other use	Process solvent	Processing into formulation, mixture, or reaction product
Commercial Use	Plastic and rubber products	Products such as: plastic and rubber products	Plastic and rubber products[f]

COU			OES
Life Cycle Stage[a]	Category[b]	Subcategory[c]	
	Fuels and related products	Fuels and related products	Fuels and related products[f]
	Other use	Laboratory chemical	Laboratory use
Consumer Use	Plastic and rubber products	Plastic and rubber products	N/A[g]
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)
			Waste handling, treatment, and disposal (POTW)
			Waste handling, treatment, and disposal (remediation)
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (non-POTW WWT)
			Waste handling, treatment, and disposal (incinerator)

[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 COUs reflect CDR codes and broadly represent COUs for 1,2-dichloroethane in industrial and/or commercial settings.

[c] These subcategories reflect more specific uses of 1,2-dichloroethane.

[d] During the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane, 1,1,2-trichloroethane, *trans*-1,2-dichloroethylene, trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride are formed, and are assessed in the draft risk evaluation. See *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

[e] EPA considers the activities of loading and unloading of chemical product part of distribution in commerce; however, these activities were assessed as part of each use's OES. EPA's current approach for quantitatively assessing releases and exposures for the remaining aspects of distribution in commerce consists of searching DOT and NRC data for incident reports pertaining to 1,2-dichloroethane distribution.

[f] Although these uses were identified during scoping, upon further investigation, EPA made the decision to not quantitatively assess the releases and exposures due to these uses of 1,2-dichloroethane. The rationale for not performing a quantitative assessment is described in Section 1.2 of both the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) and *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at).

[g] Consumer uses are not assigned to OESs but are assessed elsewhere in this draft risk evaluation. See also the *Draft Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q).

As stated in table footnote *d* in Table 3-1 above, during the manufacture of 1,2-dichloroethane, the byproducts 1,1-dichloroethane (75-34-3), 1,1,2-trichloroethane (7900-5), *trans*-1,2-dichloroethylene

(156-60-5), trichloroethylene (79-01-6), perchloroethylene (127-18-4), methylene chloride (75-09-2), and carbon tetrachloride (56-23-5) are unintentionally formed. Releases and associated exposures from byproducts are discussed in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l) and summarized in the corresponding environmental and human exposure and risk sections (Sections 4 and 5) of this draft risk evaluation.

The production volume for each of the assessed byproducts resulting from 1,2-dichloroethane manufacturing is estimated based on the reported production volume of 1,2-dichloroethane as well as the weight percent of the byproduct in the non-purified 1,2-dichloroethane product stream provided by industry. EPA used information provided from the Vinyl Institute in several public comments (see EPA-HQ-OPPT-2018-0421-0027; EPA-HQ-OPPT-2016-0732-0013; and EPA-HQ-OPPT-2019-0500-0101) to estimate the maximum weight percent of each byproduct in various product streams to use in this draft risk evaluation (Table 3-2). The information provided in Table 3-2 was used to evaluate exposures to byproducts for the Manufacturing COU and represents maximum concentrations of byproducts that would be found in any 1,2-dichloroethane manufacturing facility. Although 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene are not assessed in the draft risk evaluation, they are included in Table 3-2 for context (*i.e.*, to show 100% total of all chemicals within a product stream).

Table 3-2. Maximum Weight Percent of Byproducts in Product Streams During the Manufacturing of 1,2-Dichloroethane

Chemical	Percent Non-Purified Product Stream	Percent Purified Product Stream	Percent Heavy-Ends Liquid [c d]	Percent Light-Ends Liquid [c d]
1,2-Dichloroethane	98.94	99.4–100	27.7	30.7
1,1-Dichloroethane	0.291	<0.1	21	30
1,1,2-Trichloroethane [a]	0.472	0.02	50	0.1
trans-1,2-Dichloroethylene [a]	0.028	<0.1	0	9
Trichloroethylene	0.0035	0 [b]	0.23	0.0999 [e]
Perchloroethylene	0.015	0 [b]	1.1	0
Methylene chloride	0.0999 [e]	0 [b]	0	0 [e]
Carbon tetrachloride	0.15	0 [b]	0	30

[a] 1,1,2-Trichloroethane and *trans*-1,2-dichloroethylene are not assessed in this draft risk evaluation (or relevant TSD) but are included in the table to show 100% total of all chemicals within a product stream.
[b] No information provided; assumed 0 (%).
[c] For heavy- and light-liquid ends, the highest concentration of byproduct reported was applied with the remaining percent assumed to be 1,2-dichloroethane.
[d] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process and known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.
[e] 0.0999% assumed when "ppm levels"/"quantities" was reported.

Table 3-3. Crosswalk of Assessed Occupational Exposure Scenarios (OESs) to Conditions of Use (COUs) for 1,2-Dichloroethane

OES	COU		
	Life Cycle Stage	**Category**	**Subcategory**
Manufacturing	Manufacturing	Domestic manufacture	Domestic manufacture
Manufacturing as an unintended byproduct			
Repackaging		Import	Import
Processing as a reactant	Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing
		Recycling	Recycling
	Industrial use	Process regulator	*e.g.*, Catalyst moderator; oxidation inhibitor
Processing into formulation, mixture, or reaction product	Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: All other petroleum and coal products manufacturing
			Processing aids: specific to petroleum production
			Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing
	Industrial Use	Other use	Process solvent
Repackaging	Processing	Repackaging	Repackaging
Distribution in commerce	Distribution in Commerce	Distribution in commerce	Distribution in commerce
Industrial application of adhesives and sealants	Industrial Use	Adhesives and sealants	Adhesives and sealants
Industrial application of lubricants and greases	Industrial Use	Lubricants and greases	Solid film lubricants and greases
Commercial aerosol products	Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents
Non-aerosol cleaning and degreasing	Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents
Plastic and rubber products	Commercial Use	Plastic and rubber products	Products such as: plastic and rubber products – not quantitatively assessed
Laboratory use	Commercial Use	Other use	Laboratory chemical
N/A	Consumer Use	Plastic and rubber products	Plastic and rubber products

OES	COU		
	Life Cycle Stage	Category	Subcategory
Waste handling, treatment, and disposal (landfill)			
Waste handling, treatment, and disposal (POTW)			
Waste handling, treatment, and disposal (remediation)	Disposal	Disposal	Disposal
Waste handling, treatment, and disposal (non-POTW WWT)			
Waste handling, treatment, and disposal (incinerator)			

3.1.1.2 Description of Role/Function of 1,2-Dichloroethane for Each OES

An understanding of the role/function of 1,2-dichloroethane for each OES is important in mapping data to an OES and selecting appropriate modeling approaches to estimate releases and exposures. Brief summaries of the role/function of 1,2-dichloroethane for all OESs are presented in Table 3-4.

Table 3-4. Description of the Function of 1,2-Dichloroethane for Each OES

OES	Role/Function of 1,2-Dichloroethane
Manufacturing	This OES captures the Domestic manufacture COU category. 1,2-Dichloroethane may be produced by various methods, including by the vapor- or liquid-phase chlorination of ethylene. Additionally, 1,2-dichloroethane is manufactured as a byproduct or impurity during the intentional manufacturing of other chemical products such as dichloroethyl ether.
Repackaging	This OES captures the Import and Repackaging COU categories. 1,2-Dichloroethane may be transported in liquid cargo barges, railcars, tank trucks, tank containers, intermediate bulk containers (IBCs)/totes, and drums. A portion of the 1,2-dichloroethane manufactured is also expected to be repackaged into smaller containers for commercial laboratory use.
Processing as a reactant	This OES captures the Processing as a reactant, Recycling, and Industrial use of oxidizing/reducing agents COU categories. 1,2-Dichloroethane is primarily used to produce vinyl chloride via thermal cracking but can also be used to produce ethyleneamines and polyethyleneamines as well as an oxidation inhibitor. Additionally, EPA assumes that waste streams containing 1,2-dichloroethane may be recycled on-site and then re-introduced into the facility's process waste stream or recycled as a feedstock to be used in the manufacture of other chemicals.

OES	Role/Function of 1,2-Dichloroethane
Processing into formulation, mixture, or reaction product	This OES captures the Processing – incorporated into formulation, mixture, or reaction product COU category. Incorporation into a formulation, mixture or reaction product refers to the process of mixing or blending of several raw materials to obtain a product or mixture. 1,2-Dichloroethane is expected to be mixed or blended into adhesives and sealants, lubricants and greases, oxidizing/reducing agents, cleaning and degreasing solvents, and pesticides.
Distribution in commerce	This OES captures the Distribution in commerce COU category. 1,2-Dichloroethane is expected to be distributed in commerce for the purposes of each processing, industrial, and commercial use of 1,2-dichloroethane. EPA expects 1,2-dichloroethane to be transported from manufacturing sites to downstream processing and repackaging sites.
Industrial application of adhesives and sealants	This OES captures the Industrial use of adhesives and sealants COU category. 1,2-Dichloroethane has been identified in some industrial adhesives as residual, is present in heat resistant adhesives used in the aerospace industry, and in adhesives for plastics. It may also be used in waterproofing membranes that support adhesion used in extrusion coating laminating and printing. 1,2-Dichloroethane may also be a component of sealants that protect plastics and coatings from ultraviolet (UV) light degradation.
Industrial application of lubricants and greases	This OES captures the Industrial use of lubricants and greases COU category. 1,2-Dichloroethane may be present in solid film lubricants used to prevent metal to metal contact when used in the presence of conventional lubricants. It is also used in the aerospace industry in low friction and anti-knock coatings. EPA has conservatively assumed that lubricants and greases are spray-applied, and so for the occupational exposure assessment this OES is assumed to be the same as for the Commercial aerosol products OES described below.
Non-aerosol cleaning and degreasing	This OES captures part of the Industrial use of solvents (for cleaning and degreasing) COU category. 1,2-Dichloroethane was reported to be a component of cleaning and degreasing solvents in the aerospace industry. EPA also identified 1,2-dichloroethane present in a process cleaner. Because EPA did not identify the primary methods used in the application of industrial solvents for cleaning and degreasing, vapor degreasing was assumed for this OES. Vapor degreasing is a popular cleaning method in the electronic and metal processing industries because it is effective in removing organics such as oils, greases, lubricants, coolants, and resins from crevices and hard to clean parts.
Commercial aerosol products	This OES captures part of the Industrial use of solvents (for cleaning and degreasing) COU category. 1,2-Dichloroethane was reported to be a component of cleaning and degreasing solvents in the aerospace industry. EPA also identified 1,2-dichloroethane present in a process cleaner. EPA did not identify the primary methods used in the application of industrial solvents for cleaning/degreasing, and so for this OES aerosol degreasing was assumed. Aerosol degreasing is a process that uses an aerosolized solvent spray, typically applied from a pressurized can, to remove residual contaminants for fabricated parts. A propellant is used to aerosolize the formulation, allowing it to be sprayed onto substrates. The aerosol droplets bead up on the fabricated part and then drip off, carrying away any contaminants and leaving behind a clean surface.

OES	Role/Function of 1,2-Dichloroethane
	Similarly, aerosol lubricant products use an aerosolized spray to help free frozen parts by dissolving rust and leave behind a residue to protect surfaces against rust and corrosion. In the occupational exposure assessment, this OES is used to represent exposure to lubricants and greases.
Laboratory use	This OES captures the Commercial use of laboratory chemical (*e.g.*, reagent) COU subcategory. 1,2-Dichloroethane is used as a laboratory reference standard for instrument calibration and sample preparation. It was also reported to EPA that 1,2-dichloroethane is used as a fuel additive for the purposes of research in NASA facilities.
Waste handling, treatment, and disposal	This OES captures the Disposal COU category. Each of the OES may generate waste streams of 1,2-dichloroethane that are collected and transported to third-party sites for disposal or treatment and these cases are assessed under this OES.

3.1.2 Estimating the Number of Release Days per Year for Facilities in Each OES

EPA's general approach is to estimate both an annual (kg/site-year) and a daily (kg/site-day) release rate for a facility. The annual release and average daily release of 1,2-dichloroethane can be utilized in evaluating potential environmental concentrations, as discussed in Section 3.3. Data on the number of release days for a facility are not available from data sources such as Discharge Monitoring Reports (DMR) and the Toxics Release Inventory (TRI). As a surrogate, EPA uses generic estimates of the number of operating days (days/year) for facilities in each OES as presented in Table 3-5. See the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for further discussion on the methodologies used to estimate the number of operating days.

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

OES	Operating Days (days/year)	Basis
Manufacturing	350	For the manufacture of the large-PV solvents, EPA assumes 350 days/year for release frequency. This assumes the plant runs 7 days/week and 50 weeks/year (with 2 weeks down for turnaround) and assumes that the plant is always producing the chemical.
Repackaging	250	Assumes operation 5 days/week for 50 weeks/year.
Processing as a reactant	350	EPA assumed the manufacture of commodity chemicals occurs 350 days per year such that the use of a chemicals as a reactant to manufacture a commodity chemical would also occur 350 days per year.
Processing into formulation, mixture, or reaction product	300	EPA assumed that the chemical of interest is not always in use at the facility, even if the facility operates 24/7. Therefore, in general, EPA used a value of 300 days/year based on the Specific Environmental Release Categories (SpERC) Fact Sheet – Formulation & (Re)Packing of Substances and Mixtures – Industrial (Solvent-Borne),

OES	Operating Days (days/year)	Basis
		which uses a default of 300 days/year for the chemical industry (ESIG, 2012).
Industrial application of adhesives and sealants	260	The April 2015 ESD on Use of Adhesives (OECD, 2015) estimates a default of 260 operating days/year.
Industrial application of lubricants and greases	250	Assumes operation 5 days/week for 50 weeks/year.
Industrial and commercial non-aerosol cleaning and degreasing	250	Assumes operation 5 days/week for 50 weeks/year.
Industrial and commercial aerosol products	250	Assumes operation 5 days/week for 50 weeks/year.
Commercial laboratory use	260	The Draft Generic Scenario (GS) on Use of Laboratory Chemicals (U.S. EPA, 2023d) estimates a default of 260 operating days/year per the Bureau of Labor Statistics OES data.
Waste handling, treatment, and disposal (landfills)	250	It is unlikely that non-POTW waste handling, treatment, and disposal facilities handle 1,2-dichloroethane every day; therefore, EPA assumes 250 days/year (5 days/week, 50 weeks/year).
Waste handling, treatment, and disposal (POTW, non-POTW WWT)	365	POTWs are expected to operate continuously over 365 days/year; therefore, 365 days/year should be used.
Waste handling, treatment, and disposal (remediation)	365	Remediate sites are expected to operate continuously over 365 days/year; therefore, 365 days/year should be used.
[a] See Section 2.3.2 of the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for more information on the number of days.		

3.1.3 Daily Release Estimation

EPA collected facility release data for 1,2-dichloroethane from the TRI (years 2015–2020), DMR (years 2015–2020), and National Emissions Inventory (NEI; years 2014 and 2017).[7] TRI provides facility-specific data on releases to air, water, and land; DMR includes data on water releases; and NEI provides process-level data (*i.e.*, contains data on air emissions). Data are available in each of these data sources that can be utilized to map the facility to an OES. In brief, mapping consists of using facility-reported industry sectors (typically reported as either North American Industry Classification System [NAICS] or Standard Industrial Classification [SIC] codes), and chemical activity, processing, and use information to assign the most likely OES to each facility.

When releases are expected for an OES, but TRI, DMR, and/or NEI data or release data from systematic review are not available, EPA uses modeling to estimate releases. Modeling is also performed when there is limited facility release data available and the number of sites for the OES may be much higher

[7] A preliminary review of the 2021 to 2023 TRI release data shows that releases are generally consistent with those from 2015 to 2020—except for land releases, which are significantly higher. This increase is primarily due to one TRI-reporting facility (TRIFID 77536DSPSL2525B) that did not report land releases of 1,2-dichloroethane in previous years. Similarly, a preliminary review of the 2021 to 2025 DMR and 2020 NEI release data indicates that releases are generally on the same order of magnitude as the 2015 to 2020 releases.

than what is captured by the facility release data. EPA modeled releases for the following OESs: Industrial application of adhesives and sealants, Industrial and commercial non-aerosol cleaning and degreasing, Industrial and commercial aerosol products, and Commercial laboratory use. EPA identified model input parameters and equations from relevant literature sources, generic scenarios (GSs), or emission scenario documents (ESDs). For each modeled OES, a Monte Carlo simulation with 100,000 iterations was conducted to capture variability in input parameters and estimate total 1,2-dichloroethane releases by environmental media across all sources in each iteration. EPA selected the 50th and 95th percentile values to represent the central tendency and high-end releases, respectively.

EPA compiled the environmental releases by air, water, and disposal media for each OES. Annual and daily release estimates are presented as 50th and 95th percentiles. Where available, EPA used NEI, GSs, or ESDs to estimate number of release days, which the Agency used to convert between annual release estimates and daily release estimates. EPA used 2020 CDR, TRI, DMR, NEI, and Monte Carlo modeling data to estimate the number of sites using 1,2-dichloroethane within an OES.

For each OES, EPA develops a conclusion on the weight of scientific evidence supporting the environmental release estimates based on the strengths, limitations, and uncertainties associated with the release estimates. The Agency considers factors that increase or decrease the strength of the evidence supporting the release estimate—including quality of the data/information, applicability of the release data to the COU (including considerations of temporal relevance, locational relevance), and the representativeness of the estimate across the whole industry.

The *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) describes EPA's approach and methodology for estimating daily releases and provides detailed facility-level results for each OES.

3.1.4 Releases of 1,2-Dichloroethane from Disposal of Consumer Articles

Consumer articles containing 1,2-dichloroethane are not manufactured in the United States, rather only imported from China (Danish EPA, 2018; Doucette et al., 2010). Based on the assessment of consumer exposures to these articles during their use, levels of 1,2-dichloroethane did not present a human health concern. Additionally, as presented in the *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q), the emission rate of 1,2-dichloroethane varies by article. However, for all these articles the decay occurs within 2 months so that by the time the articles are disposed, the remaining levels of 1,2-dichloroethane are expected to be very low.

3.2 Summary of Environmental Releases

3.2.1 Manufacturing, Processing, Industrial and Commercial

EPA combined its estimates for annual releases, release days, number of facilities, and hours of release per day to estimate a range of daily releases for each OES. Table 3-6 presents a summary of these ranges across facilities. See the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for additional detail. EPA was unable to estimate site-specific releases for the OES covering the final use of articles. As mentioned above, disposal sites handling post-consumer, end-use 1,2-dichloroethane were not quantifiable based on the data available.

1148 **Table 3-6. Summary of Environmental Releases by Occupational Exposure Scenario for 1,2-Dichloroethane**

OES	Type of Discharge,[a] Air Emission,[b] or Transfer for Disposal[c]	Estimated Annual Release (kg/site-yr) [d]		Estimated Daily Release (kg/site-day) [e]		Number of Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Manufacturing	Surface water	0.8	51	2.4E−03	0.15	33	TRI/DMR
	Fugitive air	3,528	1.6E04	10	46	22	TRI
	Stack air	1,249	1.2E04	3.6	35	23	TRI
	Fugitive air	2,970	1.0E04	8.5	29	20	NEI
	Stack air	903	303	2.6	18	22	NEI
	Land	2.3	247	6.5E−03	0.71	14	TRI
Repackaging	Surface water	1.3E−02	103	5.1E−05	0.41	19	TRI/DMR
	Fugitive air	170	227	0.68	0.91	4	TRI
	Stack air	170	227	0.68	0.91	4	TRI
	Fugitive air	1.4E−02	105	5.7E−05	0.42	28	NEI
	Stack air	4.2	588	1.7E−02	2.4	11	NEI
	Fugitive or stack air	3.6	5.8	8.4E−02	0.15	N/A	Environmental release modeling
	Hazardous waste landfill or incineration	275	320	6.5	10	N/A	Environmental release modeling
Processing as a reactant	Surface water	0.21	103	6.0E−04	0.29	21	TRI/DMR
	Fugitive air	45	370	0.13	1.1	11	TRI
	Stack air	6.8	252	1.9E−02	0.72	10	TRI
	Fugitive air	73	4,227	0.21	12	17	NEI
	Stack air	17	1,834	4.8E−02	5.2	13	NEI
	Land	3.6	29	1.0E−02	8.2E−02	1	TRI
Processing into formulation, mixture, or reaction product	Surface water	0.24	11	8.1E−04	3.6E−02	22	TRI/DMR
	Fugitive air	292	2,232	0.97	7.4	9	TRI
	Stack air	340	1,996	1.1	6.7	11	TRI
	Fugitive air	83	444	28	1.5	9	NEI
	Stack air	14	1,689	4.6E−02	5.6	8	NEI

<table>
<tr><th rowspan="2">OES</th><th rowspan="2">Type of Discharge,[a] Air Emission,[b] or Transfer for Disposal[c]</th><th colspan="2">Estimated Annual Release (kg/site-yr) [d]</th><th colspan="2">Estimated Daily Release (kg/site-day) [e]</th><th rowspan="2">Number of Facilities[f]</th><th rowspan="2">Source(s)</th></tr>
<tr><th>Central Tendency[g]</th><th>High-End</th><th>Central Tendency</th><th>High-End</th></tr>
<tr><td rowspan="4">Industrial application of adhesives and sealants</td><td>Fugitive air</td><td>2.4</td><td>338</td><td>9.0E−03</td><td>1.3</td><td>38</td><td>NEI</td></tr>
<tr><td>Stack air</td><td>4.5</td><td>282</td><td>1.7E−02</td><td>1.1</td><td>65</td><td>NEI</td></tr>
<tr><td>Fugitive or stack air</td><td>4.4E03[h]</td><td>4.4E03[h]</td><td>59</td><td>162</td><td>N/A</td><td>Environmental release modeling</td></tr>
<tr><td>Hazardous landfill or incineration</td><td>155</td><td>174</td><td>2.1</td><td>5.8</td><td>N/A</td><td>Environmental release modeling – modeled releases to incineration are further assessed by applying a DRE to estimate the resulting stack air release</td></tr>
<tr><td rowspan="2">Industrial application of lubricants and greases</td><td>Fugitive air</td><td>7.3E−02</td><td>82</td><td>2.9E−04</td><td>0.33</td><td>2</td><td>NEI</td></tr>
<tr><td>Stack air</td><td colspan="3">8.8E−03</td><td>3.5E−05</td><td>1</td><td>NEI</td></tr>
<tr><td rowspan="9">Industrial and commercial non-aerosol cleaning/ degreasing</td><td>Surface water</td><td>0.13</td><td>0.26</td><td>5.2E−04</td><td>1.0E−03</td><td>3</td><td>TRI/DMR</td></tr>
<tr><td>Fugitive air</td><td>5.4</td><td>7.8</td><td>2.2E−02</td><td>3.1E−02</td><td>1</td><td>TRI</td></tr>
<tr><td>Stack air</td><td>1.2</td><td>16</td><td>5.0E−03</td><td>6.3E−02</td><td>1</td><td>TRI</td></tr>
<tr><td>Fugitive air</td><td>1.5</td><td>41</td><td>6.0E−03</td><td>0.17</td><td>12</td><td>NEI</td></tr>
<tr><td>Stack air</td><td>3.5</td><td>455</td><td>1.4E−02</td><td>1.8</td><td>15</td><td>NEI</td></tr>
<tr><td>Fugitive or stack air</td><td>1.3E04</td><td>4.2E04</td><td>42</td><td>141</td><td>N/A</td><td>Environmental release modeling</td></tr>
<tr><td>Wastewater treatment</td><td>662</td><td>2,606</td><td>2.2</td><td>8.8</td><td>N/A</td><td>Environmental release modeling – modeled releases to wastewater treatment are further assessed by applying a removal efficiency to estimate the resulting surface water discharge</td></tr>
<tr><td>Hazardous waste incineration</td><td>7,152</td><td>3.1E04</td><td>24</td><td>103</td><td>N/A</td><td>Environmental release modeling – modeled releases to incineration are further assessed by applying a DRE to estimate the resulting stack air release</td></tr>
<tr><td>Hazardous waste landfill</td><td>64</td><td>255</td><td>0.24</td><td>0.86</td><td>N/A</td><td>Environmental release modeling</td></tr>
</table>

OES	Type of Discharge,[a] Air Emission,[b] or Transfer for Disposal[c]	Estimated Annual Release (kg/site-yr) [d]		Estimated Daily Release (kg/site-day) [e]		Number of Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Commercial aerosol products	Fugitive air	379	382	1.5	1.5	N/A	Environmental release modeling
Laboratory use	Surface water	6.7E−03	6.9E−02	2.6E−05	2.6E−04	4	TRI/DMR
	Fugitive air	1.3	10	5.2E−03	3.8E−02	6	NEI
	Stack air	126	233	0.48	0.90	2	NEI
	Fugitive or stack air	1.7	11	7.3E−03	4.5E−02	N/A	Environmental release modeling
	Hazardous landfill or incineration	15	812	6.5E−02	3.5	N/A	Environmental release modeling – modeled releases to incineration are further assessed by applying a DRE to estimate the resulting stack air release
Waste handling, treatment, and disposal (incinerator)	Surface water	0.91	87	3.6E−03	0.35	3	TRI/DMR
	Fugitive air	1.8	186	7.3E−03	0.74	16	TRI
	Stack air	0.82	113	3.3E−03	0.45	16	TRI
	Fugitive air	0.49	110	2.0E−03	0.44	25	NEI
	Stack air	3.0E−02	39	1.2E−04	0.16	61	NEI
Waste handling, treatment, and disposal (landfill)	Surface water	2.4E−02	2.2	9.6E−05	9.0E−03	11	TRI/DMR
	Fugitive air	5.0	33	2.0E−02	0.13	634	NEI
	Stack air	0.52	23	2.1E−03	9.1E−02	127	NEI
Waste handling, treatment, and disposal (non-POTW WWT POTW)	Surface water	0.86	2	3.4E−03	0.01	3	TRI/DMR
	Fugitive air	7.7	329	3.1E−02	1.3	12	NEI
	Stack air	2.8	189	1.1E−02	0.76	9	NEI

OES	Type of Discharge,[a] Air Emission,[b] or Transfer for Disposal[c]	Estimated Annual Release (kg/site-yr) [d]		Estimated Daily Release (kg/site-day) [e]		Number of Facilities[f]	Source(s)
		Central Tendency[g]	High-End	Central Tendency	High-End		
Waste handling, treatment, and disposal (POTW)	Surface water	0.63	31	1.7E−03	8.4E−02	141	TRI/DMR
	Fugitive air	8.4	138	3.4E−02	0.55	26	NEI
	Stack air	15	37	6.0E−02	0.15	3	NEI
Waste handling, treatment, and disposal (remediation)	Surface water	1.8E−02	0.32	5.0E−05	8.8E−04	19	TRI/DMR
	Fugitive air	1.8	30	4.8E−03	8.1E−02	28	NEI
	Stack air	417	1,403	1.1	3.8	3	NEI
Facilities not mapped to an OES	N/A					157[i]	–

[a] Direct discharge to surface water; indirect discharge to non-POTW WWT; indirect discharge to POTW
[b] Emissions via fugitive air, stack air, or treatment via incineration
[c] Transfer to surface impoundment, land application, or landfills
[d] For modeled results, the presented central tendency and high-end are the 50th and 95th percentile values of the modeled distribution. For programmatic data, the presented central tendency is calculated from the median reported release amounts and high-end from the reported maximum release amounts. The specific central tendency and high-end values presented depends on the number of sites with programmatic data. For databases with 6 or more reporting facilities, EPA estimated central tendency and high-end releases using the 50th and 95th percentile values, respectively. For 3–5 facilities, EPA estimated the central tendency and high-end releases using the 50th percentile and maximum values, respectively. For 2 sites, EPA presented the midpoint and the maximum value. Finally, EPA presented sites with only 1 data point as-is from the programmatic database.
[e] Where available, EPA used peer reviewed literature (*e.g.*, GSs or ESDs) to provide a basis to estimate the number of release days of 1,2-dichloroethane within a COU.
[f] Where available, EPA used the 2020 CDR (U.S. EPA, 2020a), NEI (U.S. EPA, 2023a), DMR (U.S. EPA, 2022b) and TRI databases (U.S. EPA, 2022d), 2020 U.S. County Business Practices (U.S. Census Bureau, 2022), and Monte Carlo models to estimate the number of sites that use 1,2-dichloroethane for each COU. Some modeled OES calculated the number of facilities/sites, presented as 50th and 95th percentiles. Other modeled OESs set the number of facilities deterministically, presented as 1 value.
[g] The central tendency values for NEI air were calculated using the median of the reported releases at each site.
[h] These central tendency and high-end releases appear equivalent in the table due to rounding.
[i] There were 157 facilities not mapped to an OES with 1,2-dichloroethane releases that EPA was unable to map due to the lack of information regarding the activity of 1,2-dichloroethane at the site. These sites do not fit in any of the 1,2-dichloroethane OESs because they are mainly hotels, businesses, and various chemical facilities where 1,2-dichloroethane use is unknown.

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3.2.1.1 Environmental Releases of Byproducts from 1,2-Dichloroethane Manufacturing

EPA received data from Vinyl Institute on the formation of byproducts resulting from the manufacture of 1,2-dichloroethane. The Agency presents the methodology and release estimates of byproducts in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). Across all but one of the assessed byproducts (1,1-dichloroethane), the estimated releases for these chemicals when produced as a byproduct were lower.

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

EPA integrates evidence streams across systematic review sources to develop environmental release estimates for 1,2-dichloroethane. The Agency made a judgment on the weight of scientific evidence supporting the release estimates based on the strengths, limitations, and uncertainties associated with the release estimates. The conclusion is summarized using confidence descriptors: robust, moderate, or slight. EPA considers factors that increase or decrease the strength of the evidence supporting the release estimate—including quality of the data/information, applicability of the release data to the COU (including considerations of temporal relevance, locational relevance, and the representativeness of the estimate for the whole industry).

In general, higher-rated studies (as determined through data evaluation) increase the weight of scientific evidence when compared to lower-rated studies, and EPA gives preference to chemical- and scenario-specific data over surrogate data (*e.g.*, data from a similar chemical or scenario). See the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) for additional information on weight of scientific evidence conclusions.

Table 3-7 summarizes EPA's overall weight of scientific evidence conclusions for its release estimates for each of the assessed OES. For more detail, see the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag).

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OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Manufacturing	Moderate to Robust	For this OES, EPA had release information for water, land, and air from TRI, water from DMR, and air from NEI. Water releases are assessed using reported releases from 2015–2020 TRI and DMR. These databases received a high data quality rating in systematic review. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Factors that decrease the overall confidence for this estimate include the uncertainty in the accuracy of reported releases, and uncertainty in mapping sites to DMR to the Manufacturing OES. Most facilities only report NAICS code; therefore, it is uncertain whether the site performs manufacturing or another chemical process, such as processing as a reactant. Additionally, there are 15 manufacturing sites that report releases to other media in other reporting databases (DMR, NEI, etc.), but do not report releases to water in TRI. It is unclear whether these sites do not release to water, or the site does not meet reporting thresholds for TRI. Air releases are assessed using reported releases from 2015–2020 TRI and 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. A factor that decreases the overall confidence for this OES is that EPA made assumptions on the number of operating days to estimate daily releases. Land releases are assessed using reported releases from 2015–2020 TRI. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Factors that decrease the overall confidence for this estimate include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and DMR may not capture all relevant sites. Based on other reporting databases (CDR, DMR, NEI, etc.), there are 30 additional manufacturing sites that report releases to other media but do not report releases to land. In conclusion, although there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated high in systematic review and provide releases directly from a wide number of manufacturing facilities. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Repackaging	Moderate to Robust	For this OES, EPA had release information for water and air from TRI, water from DMR, and air from NEI. Water releases are assessed using reported releases from 2015–2020 TRI and DMR. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Factors that decrease the overall confidence for this estimate include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and DMR may not capture all relevant sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 47 additional repackaging sites that report releases to other media but do not report releases to water.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Repackaging *(continued)*	Moderate to Robust *(continued)*	Air releases are assessed using reported releases from 2015–2020 TRI and 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Additionally, EPA made assumptions on the number of operating days to estimate daily releases. Based on other reporting databases (CDR, DMR etc.), there are 16 additional repackaging sites that report releases to other media but do not report releases to air. Land releases are assessed using reported releases from 2015–2020 TRI; however, there were no land releases reported to any database for repackaging of 1,2-dichloroethane. These releases needed to be modeled, as there may be releases from container cleaning that are sent to landfill, based on typical releases during the repackaging process (see the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag)). In conclusion, although there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated high in systematic review and provide releases directly from a wide number of repackaging facilities. For the modeling, EPA assessed releases using the assumptions and values from the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a), which the systematic review process rated high for data quality. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the GS and EPA/OPPT models. EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Processing as reactant	Moderate to Robust	For this OES, EPA had release information from water, land, and air from TRI, water from DMR, and air from NEI. Water releases are assessed using reported releases from 2015–2020 TRI and DMR, which both have a high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 28 reporting sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs (manufacturing, processing as a reactant, etc.) Based on other reporting databases (CDR, NEI, etc.), there are 14 additional sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from 2015–2020 TRI and 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), 12 additional sites that report releases to other media but do not report releases to air. Land releases are assessed using reported releases from 2015–2020 TRI. The primary limitation is that the land release assessment is based on 4 reporting sites and EPA did not have additional sources to estimate land releases from this OES. Based on other reporting databases (CDR, DMR, NEI, etc.), there are 38 additional sites that report releases to other media but do not report releases to land. In conclusion, although there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated high in systematic review and provide releases directly from a wide number of facilities that process 1,2-dichloroethane as a reactant. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Processing into formulation, mixture, or reaction product	Moderate to Robust	For this OES, EPA had release information from water and air from TRI, water from DMR, and air from NEI. Water releases are assessed using reported releases from 2015–2020 TRI and DMR, which both have a high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 18 reporting sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 6 additional sites that report releases to other media but do not report releases to water.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Processing into formulation, mixture, or reaction product *(continued)*	Moderate to Robust *(continued)*	Air releases are assessed using reported releases from 2015–2020 TRI and 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), there are nine additional sites that report releases to other media but do not report releases to air. In conclusion, though there is uncertainty of whether the databases capture all sites releasing to each medium, the release data are rated high in systematic review and provide releases directly from a wide number of facilities that use 1,2-dichloroethane during processing into formulation, mixture, or reaction product. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data.
Application of adhesives and sealants	Slight to Moderate	For this OES, EPA had release information only for air from NEI. EPA identified 83 facilities reporting air releases of 1,2-dichloroethane that were potentially relevant to the application of adhesives and sealants. EPA determined these data are not sufficient to confidently capture the entirety of environmental releases for this scenario due to the fact they were from the NEI database and only reported on releases to air. Therefore, releases to the environment were also assessed using the Emission Scenario Document on Use of Adhesives (OECD, 2015). This ESD has a high data quality rating from the systematic review process (U.S. EPA, 2023d). EPA used this ESD combined with Monte Carlo modeling to estimate the amount of chemical that gets released from the process and then may go to air, wastewater treatment, landfill or destruction by incineration with media of release assessed using assumptions from the ESD model. More information about the details and assumptions of the model can be found in Appendix A.5 of the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. EPA also believes the primary limitation to be the uncertainty in the representativeness of model values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane chemical throughput data (*i.e.*, kg of chemical used per site per year); therefore, the number of facilities is based on one generic site and a maximum throughput of 10,000 lb/yr was assumed based on TRI reporting thresholds. Comparison of modeled values with the NEI data is difficult due to uncertainty on the throughput (kg/site-yr) of 1,2-dichloroethane at the NEI sites in comparison to the throughput value used in the modeling. Overall, EPA concludes the weight of scientific evidence for this assessment is moderate for the NEI air release data with lower confidence in the modeling results due to uncertainty in the throughput (kg/site-yr) value assumed and whether that may overestimate releases from the process.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Application of lubricants and greases	Slight to Moderate	For this OES, EPA had release information for air from NEI. EPA identified 4 facilities reporting air releases of 1,2-dichloroethane in NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases as well as the limitations in representativeness to all sites because NEI may not capture all relevant sites. This is a particular concern for application of lubricants and greases because only 4 facilities were mapped to this use. To bolster the limited release data provided by NEI, Application of lubricants and greases was assessed by modeling the release of 1,2-dichloroethane due to the use of aerosol product. EPA applied a methodology, described in Section 3.9 of the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag), based on a 100% release scenario to fugitive air which means that all 1,2-dichloroethane used in this scenario is assumed to be released to fugitive air. The 100% assumption is conservative. From a mass balance perspective: the quantity purchased and applied is not expected to be chemically converted or remain on the applied surface. A small percentage of residual material may remain in the container that would likely go to landfill. EPA does expect that a high percentage of the quantity of chemical purchased and applied at the sites would eventually be released to air. This methodology calculated the release amounts using the amount of 1,2-dichloroethane used per application, number of applications per job, and number of jobs per site-year. The release model uses data from the California Air Resources Board (CARB) to estimate use rates; 100% of the sprayed 1,2-dichloroethane is expected to be released to air. EPA used this methodology combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed only for fugitive air. More information about the details and assumptions of the model can be found in Appendix A.6 of the *Draft Environmental Release Assessment for Risk Evaluation for 1,2-Dichloroethane* (U.S. EPA, 2025ag). EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. EPA also believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane chemical throughput data, number of facilities, and estimates for other release media. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a slight to moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Industrial and commercial non-aerosol cleaning/ degreasing	Slight to Moderate	For this OES, EPA had release information for water and air from TRI, for water from DMR, and for air from NEI. EPA identified 25 facilities reporting air releases of 1,2-dichloroethane potentially related to cleaning/degreasing. Due to the difficulty of determining the exact activities that occur at each site and the method of use (aerosol vs. non-aerosol), EPA assumed that the 25 sites may potentially use non-aerosol cleaning/degreasing based on the industry and source classification codes for each source. Since so few sites reported to the databases and data points from NEI report only air

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Industrial and commercial non-aerosol cleaning/ degreasing *(continued)*	Slight to Moderate *(continued)*	releases, EPA also chose to model releases for non-aerosol cleaning and degreasing to obtain estimates for releases to other media. Therefore, releases to the environment are also assessed using the ESD on the Use of Vapour Degreasers (OECD, 2013). This ESD has a high data quality rating from the systematic review process (U.S. EPA, 2023d). EPA used this ESD combined with Monte Carlo modeling to estimate releases to the environment, with media of release assessed using assumptions from the ESD model. More information about the details and assumptions of the model can be found in Appendix A.4 of *the Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) Water releases are assessed using reported releases from 2015–2020 TRI and DMR, which both have a high overall data quality determination from the systematic review process. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. The water release assessment is based on 3 reporting sites. There is uncertainty in mapping sites to TRI and DMR as most facilities only report NAICS code; therefore, it is uncertain what type of chemical process the site performs and whether it is directly applicable to the assessed OES. Based on other reporting databases (CDR, NEI, etc.), there are 2 additional sites that report releases to other media but do not report releases to water. Air releases are assessed using reported releases from 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the overall confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because NEI may not capture all relevant sites. Based on other reporting databases (CDR, DMR, etc.), 3 additional sites that report releases to other media but do not report releases to air. To bolster the limited release data for this OES, EPA also modeled this OES under the assumption that Vapor Degreasing is the method used for cleaning and degreasing using products containing 1,2-dichloroethane. EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential release values is more likely than a discrete value to capture actual releases at sites. EPA also believes the primary limitation to be the uncertainty in the actual method when 1,2-dichloroethane is used in non-aerosol cleaning and degreasing (vapor degreasing was chosen as a conservative assumption), and uncertainty about the representativeness of values toward the true distribution of potential releases. In addition, the Agency lacks 1,2-dichloroethane throughput data and number of facilities; therefore, the number of facilities and throughput estimates are based on ~~stock~~ throughputs provided by the ESD and applying conservative assumptions from public comments provided to EPA (see Appendix A.4 of the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag)). Based on this information, EPA concluded that the weight of scientific evidence for this assessment is slight to moderate.

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
Industrial and commercial aerosol products	Slight to Moderate	For this OES, EPA had no release information from standard sources. The lack of release information from the databases introduces some uncertainty to the estimation because EPA could only rely on modeled results. EPA applied a methodology based on a 100% release scenario to fugitive air, which means that all 1,2-dichloroethane used in this scenario is assumed to be released to fugitive air. The 100% assumption is conservative, but EPA does expect that a high percentage of the quantity of chemical purchased and applied at the sites would eventually be released to air. This methodology calculated the release amounts using the amount of 1,2-dichloroethane used per application, number of applications per job, and number of jobs per site-year. The release model uses data from CARB to estimate 1,2-dichloroethane use rates; 100% of the sprayed 1,2-dichloroethane is expected to be released to air. EPA used this methodology combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed only for fugitive air. More information about the details and assumptions of the model can be found in Appendix A.6 of the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag). EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. EPA further believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, the Agency lacks 1,2-dichloroethane chemical throughput data, number of facilities, and estimates for other release media. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a slight to moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Laboratory use	Moderate	For this OES, EPA had release information for water from DMR and for air from NEI. EPA identified 14 facilities reporting water and air releases of 1,2-dichloroethane potentially related to laboratory use. However, EPA determined this data is not sufficient to capture the entirety of environmental releases for this scenario. Therefore, releases to the environment are assessed using the Draft GS on the Use of Laboratory Chemicals, which has a high data quality rating from the systematic review process (U.S. EPA, 2023d). The Agency used EPA/OPPT models combined with Monte Carlo modeling to estimate releases to the environment with media of release assessed using assumptions from the ESD and EPA/OPPT models. EPA assumed that the media of release for disposal of laboratory waste is to hazardous waste landfill or incineration, per the GS. EPA believes a strength of the Monte Carlo modeling approach is that variation in model input values and a range of potential releases values is more likely than a discrete value to capture actual releases at sites. EPA further believes the primary limitation to be the uncertainty in the representativeness of values toward the true distribution of potential releases. In addition, EPA lacks 1,2-dichloroethane laboratory chemical throughput data; therefore, throughput estimates are based on stock solution throughputs from the Draft GS on the Use of Laboratory Chemicals and on CDR reporting

OES[a]	Confidence Rating	Weight of Scientific Evidence Conclusion in Release Estimate
		thresholds. EPA also has an estimate for the number of laboratories only through the fourteen facilities reporting to DMR and NEI, which may not capture all sites if some laboratories do not report to the programmatic databases. EPA has more certainty regarding the use of 1,2-dichloroethane for this OES from safety data sheets (SDSs) and combines that with the facility release data available and supporting evidence from the model. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of releases in consideration of the strengths and limitations of reasonably available data.
Waste handling, treatment, and disposal	Moderate to Robust	***Waste Handling, Treatment, and Disposal (Incinerator, Landfill, and Non-POTW WWT)*** For this OES, EPA had release information for air and water from TRI, for water from DMR, and for air from NEI. Water releases for non-POTW sites are assessed using reported releases from 2015–2020 TRI and DMR. The primary strength of TRI data is that TRI compiles the best readily available release data for all reporting facilities. Air releases for non-POTW sites are assessed using reported releases from 2015–2020 TRI and 2014 and 2017 NEI. A strength of NEI data is that NEI captures additional sources that are not included in TRI due to reporting thresholds. Factors that decrease the confidence for this OES include the uncertainty in the accuracy of reported releases, and the limitations in representativeness to all sites because TRI and NEI may not capture all relevant sites. Additionally, EPA made assumptions on the number of operating days to estimate daily releases. Based on this information, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data. ***Waste Handling, Treatment, and Disposal (POTW and Remediation)*** For this OES, EPA had release information for water from TRI, for water from DMR, and for air from NEI. Water releases for POTW and remediation sites are assessed using reported releases from 2015–2020 DMR and 2014 and 2017 NEI. DMR has a medium overall data quality determination from the systematic review process and NEI has a high rating. Of note, the Variability and Uncertainty data quality metric was determined to be medium. A strength of using DMR data and the Pollutant Loading Tool is that the tool calculates an annual pollutant load by integrating monitoring period release reports provided to the EPA and extrapolating over the course of the year. However, this approach assumes average quantities, concentrations, and hydrologic flows for a given period are representative of other times of the year. Based on this information, for POTW releases, EPA concluded that the weight of scientific evidence for this assessment provides a moderate to robust estimate of releases in consideration of the strengths and limitations of reasonably available data.

[a] OES for Distribution in commerce is not present in this table because it was not quantitatively assessed.

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3.2.1.3 Strengths, Limitations, Assumptions, and Key Sources of Uncertainty for the Environmental Release Assessment

Strengths

EPA compiled release information using reported releases from the 2015 through 2020 TRI (U.S. EPA, 2022d), 2015 through 2020 DMR (U.S. EPA, 2022b), as well as the 2014 and 2017 NEI (U.S. EPA, 2023a). NEI and TRI obtained a high data quality rating, and DMR obtained a medium data quality rating from EPA's systematic review process. TRI-reporting facilities are required to submit their "best available data" to EPA for TRI reporting purposes. Some facilities are required to measure or monitor emission or other waste management quantities due to regulations unrelated to TRI (*e.g.*, permitting requirements) or due to company policies. These existing, reasonably available data are often used by facilities for TRI reporting purposes as they represent the best available data; for example, stack releases can be directly measured by stack testing using EPA reference methods providing a directly measured emission rate that can then be used to calculate annual emissions. Because DMR-reporting facilities are required to monitor, measure, and report effluent at regular intervals, they generate many site-specific water release datapoints. Although NEI does not require stack testing or continuous emissions monitoring and reporting, agencies may use different emission estimation methods, and reasonable estimates may be obtained through mass-balance calculations, the use of emission factors, and engineering calculations.

Limitations

Facilities are only required to report to TRI if the facility has 10 or more full-time employees, is included in an applicable NAICS code, and manufactures, processes, or uses the chemical in quantities greater than a certain threshold (25,000 lb for manufacturers and processors and 10,000 lb for users). For NEI, the Air Emissions Reporting Requirements (AERR) only requires Criteria Air Pollutants (CAP) data reporting, Hazardous Air Pollutants (HAP) data reporting is voluntary. DMR data are submitted by National Pollutant Discharge Elimination System (NPDES) permit holders to states or directly to EPA according to the monitoring requirements of the facility's permit. States are only required to load major discharger data into DMR and may or may not load minor discharger data. Permits vary in their sampling requirements. Some may require monthly sampling while others may only require sampling every 6 months.

Manufacturers and importers of 1,2-dichloroethane submit CDR data to EPA if they meet reporting threshold requirements. Sites are generally only required to report production data to CDR if their yearly production volume exceeds 25,000 lb. Sites can also claim their production volume as CBI, further limiting the production volume information in CDR. As a result, some sites that produce or use 1,2-dichloroethane may not be included in the CDR dataset and the total production volume for a given OES may be underestimated. The extent to which sites that are not captured in the CDR release 1,2-dichloroethane into the environment is unknown. The media of release for these sites are also unknown.

Assumptions and Uncertainties

There is some uncertainty in the DMR data pulled using the ECHO Pollutant Loading Tool Advanced Search option. For facilities that reported having zero pollutant loads to DMR, the EZ Search Load Module uses a combination of setting non-detects equal to zero and as one-half the detection limit to calculate the annual pollutant loadings. This method could cause overestimation or underestimation of annual and daily pollutant loads. A strength of using DMR data and the Pollutant Loading Tool is that the tool calculates an annual pollutant load by integrating monitoring period release reports provided to the EPA and extrapolating over the course of the year. However, this approach assumes average quantities, concentrations, and hydrologic flows for a given period are representative of other times of the year.

When monitoring or direct measurement data are not reasonably available or are known to be non-representative for TRI reporting purposes, the TRI regulations require that facilities determine release and other waste management quantities of TRI-listed chemicals by making reasonable estimates. There is additional uncertainty in daily release estimates for air emissions. Facilities reporting to TRI report annual air emissions while NEI reports annual air emissions and the estimated number of release days. To assess daily air emissions for TRI, EPA used relevant data from relevant ESDs or GSs to estimate the expected number of release days.

CDR information on the downstream processing and use of 1,2-dichloroethane at facilities is also limited; therefore, there is some uncertainty as to the production volume attributed to a given OES. For OES with limited CDR data, EPA developed potential production volume ranges given reported CDR data, known reporting thresholds, and the national aggregate production volume of 30 to 40 billion lb for 1,2-dichloroethane in 2019. To handle an OES without programmatic data, EPA used the potential production volume ranges as uniform distributions in Monte Carlo modeling when assessing releases for each OES. Due to the wide range of potential production volumes attributable to certain OES, the overall releases may be over or underestimated. 1,2-Dichloroethane releases at each site may vary from day to day, such that on any given day the actual daily release rate may be higher or lower than the estimated average daily release rate.

EPA has further identified the following additional uncertainties that contribute to the overall uncertainty in the environmental release assessment:

- **Use of Census Bureau for Number of Facilities:** In some cases, EPA estimated the maximum number of facilities for a given OES using data from the U.S. Census. In such cases, the Agency determined the maximum number of sites for use in Monte Carlo modeling from industry data from the U.S. Census Bureau, County and Business Patterns dataset (BLS, 2023).
- **Uncertainties Associated with Facility Throughputs:** EPA estimated facility throughputs of 1,2-dichloroethane containing products using various methods, including using generic industry data presented in the relevant GS or ESD or by calculation based on production volume of 1,2-dichloroethane from CDR for the given OES. Due to these uncertainties, the facility throughputs may be overestimated.
- **Uncertainties Associated with Number of Release Days Estimate:** For most OESs, EPA estimated the number of release days using programmatic data where available, or from GSs, ESDs, or SpERC factsheets when no programmatic data were found. In such cases, EPA used applicable sources to estimate a range of release days over the course of an operating year. Due to uncertainty in 1,2-dichloroethane specific facility operations, release days may be overestimated.

3.3 Summary of Concentrations of 1,2-Dichloroethane in the Environment

Based on the environmental release assessment summarized in Section 3.2 and presented in EPA's *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag), 1,2-dichloroethane is released to the environment via air, water, biosolids, and disposal to landfills. Environmental media concentrations of 1,2-dichloroethane were quantified in ambient air, soil from ambient air deposition, soil from biosolids application, surface water, and sediment. Additional analysis of surface water used as drinking water was conducted for the Human Health Risk Assessment (Section 5).

Ambient air concentrations and deposition rates of 1,2-dichloroethane were estimated using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) and Human Exposure

Model (HEM), as described in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) and *Draft General Population Exposures for 1,2-Dichloroethane* (U.S. EPA, 2025aj). Soil concentrations were calculated using air deposition rates as estimated by AERMOD. Soil concentrations resulting from land application of biosolids were estimated using a screening method that incorporated SimpleTreat4.0 and a European Chemicals Agency (ECHA) guidance document (ECHA, 2016; RIVM, 2015). Soil pore water concentrations were calculated using a modified equilibrium partitioning methodology (Fuchsman, 2003).

1,2-Dichloroethane is reported to be released to surface waters and due to its high-water solubility (8,600 mg/L) 1,2-dichloroethane remains in water. For estimates of 1,2-dichloroethane in surface water, EPA utilized facility-specfic releases from TRI and DMR and site-specific receiving water flow data. The availability of reported facility releases provides EPA the data to conduct representative estimates of 1,2-dichloroethane surface water concentrations resulting from COUs.

EPA also conducted a literature search to identify concentrations of 1,2-dichloroethane reported in peer-reviewed and gray literature sources. Where applicable, the Agency compared relevant monitored and modeled concentrations to support the use of the modeled concentrations.

3.3.1 Ambient Air Pathway

The Agency estimated ambient air concentrations using releases from three separate datasets: (1) EPA-estimated releases from generic facilities/sites (*i.e.*, where there was no site-specific location data); (2) TRI facility-reported releases; and (3) NEI facility-reported releases. The Agency used data from both NEI and TRI to capture all potential releases. TRI provides annual facility aggregated release data. NEI provides process-level release data every 3 years, with release data from 2017 and 2020 used in this draft risk evaluation. For some facilities, release data from TRI and NEI can be the same, but there are often differences between the two datasets due to differences in reporting requirements. Additionally, NEI has a lower reporting threshold than TRI and therefore might capture more facilities and OESs (Section 3.2.1.3). The results of the modeling of TRI and NEI data will be used as two separate lines of evidence and will be used in conjunction to inform the overall risk characterization (Section 5.3.6). EPA also modeled ambient air concentrations for OESs where there were either no reported releases or only a limited number of releases that Agency determined were not representative of the OES, using estimated releases for generic facilities/sites (see the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for a full description of the modeled releases where there was no site-specific location data).

In this draft risk evaluation, EPA used AERMOD to estimate ambient air concentrations and deposition rates from all modeled and reported releases. AERMOD is the highest tier model currently used by EPA for estimating ambient air concentrations from industrial point and area sources. Since EPA is using the highest tier model with facility-reported NEI and TRI data for the years assessed, EPA did not consider further refinement necessary. For each release, EPA calculated the 10th, 50th, and 95th percentile ambient air concentrations at distances from 10 to 10,000 m from the release location. Where available, EPA used site-specific data associated with the releasing facility, as reported in TRI and/or NEI (see Table 5-35 for which data sources were available for each OES and the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) for a full description of the AERMOD methodology).

For OESs where there was no site-specific location or limited facility-reported data (*i.e.*, OESs where EPA used estimated releases from generic facilities/sites as inputs for modeling of ambient air concentrations) (see Table 5-35 for which data sources were available for each OES), EPA ran the

AERMOD model using two sets of meteorological data (Lake Charles, Louisiana, and Sioux Falls, South Dakota) and using two land use scenarios (urban and rural) to represent a variety of release locations. Sioux Falls, South Dakota, and Lake Charles, Louisiana, were chosen as two meteorological stations because they represent meteorological datasets that tend to provide central tendency and high-end concentration estimates relative to the other stations within Integrated Indoor-Outdoor Air Calculator Model (IIOAC)-based on a sensitivity analysis of the average concentration and deposition predictions conducted in support of IIOAC development (see the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) for more details).

To support the modeling results of ambient air concentrations, the EPA compared AERMOD-modeled ambient air concentrations of 1,2-dichloroethane for a facility in Calvert City, Kentucky, at distances of 1,000 m and 2,500 m, with measured concentrations from Ambient Monitoring Technology Information Center (AMTIC) monitoring sites located around the same facility (U.S. EPA, 2025af) (downloaded August 2023). This comparison showed that the modeled 95th percentile average daily concentrations and the maximum 1-day monitored 1,2-dichloroethane concentrations from the AMTIC archive were within an order of magnitude of each other when the monitoring location was within 300 m of the modeled distance.

Additional monitoring was conducted by EPA at three sampling locations near the same facility in Calvert City, Kentucky, from October 2020 to December 2021 (U.S. EPA, 2024a). The monitoring site with the highest measured 1,2-dichloroethane concentrations was located 370 m from the facility and reported concentrations ranging from 4.29×10^{-2} to 221 µg/m^3 (mean 22.1 µg/m^3) with a detection frequency of 99 percent. The two other sampling sites were located approximately 1,900 and 2,500 m from the facility and had reported concentrations of 5.91×10^{-2} to 15.4 µg/m^3 (mean 1.6 µg/m^3) and 2.83×10^{-2} to 11.2 µg/m^3 (mean 1.1 µg/m^3). For comparison, the modeled 95th percentile concentrations for this facility were 3.4 and 0.75 µg/m^3 at 1,000 and 2,500 m based on the 2020 TRI-reported releases. Additionally, the modeled 50th percentile concentrations for this facility were 1.6 µg/m^3 and 0.34 µg/m^3 at 1,000 and 2,500 m based on the 2020 TRI-reported releases.

Based on the ambient air exposure analysis performed for the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj), EPA did not perform a tiering analysis for 1,2-dichloroethane. For 1,1-dichloroethane, the tiering analysis performed resulted in EPA using the most refined approach available at the time because cancer risk estimates above benchmark were found in the lower-tier analyses. Because 1,1- and 1,2-dichloroethane use the same inhalation unit risk (IUR) and reported releases of 1,2-dichloroethane to ambient air are higher than those of 1,1-dichloroethane, EPA only performed the highest-tier of exposure analysis available. For this analysis, the Agency used a combination of AERMOD and HEM to estimate ambient air exposures to the general population because both models are the highest-tier models currently used by EPA for estimating ambient air concentrations as well as exposures from industrial point and area sources.

3.3.2 Surface Water Pathway

As mentioned in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af), EPA collected 2015 to 2020 facility-reported releases of 1,2-dichloroethane to surface receiving water bodies as reported to TRI and DMR databases. For the water pathway, different hydrological flow rates were used for different exposure scenarios. The 30Q5 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. The harmonic mean flows provide a more conservative estimate as compared to annual average flows and are therefore preferred for assessing potential chronic human exposure via drinking water. 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 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, 1991). EPA estimated surface water concentrations per facility and mapped it to its corresponding OES.

3.3.3 Land Pathway

Although the physical and chemical properties of 1,2-dichloroethane suggest that it is unlikely to be present in soil, limited monitored soil concentration data of 1,2-dichloroethane were identified—particularly from the sites releasing 1,2-dichloroethane as reported in TRI and DMR. In order to assess the site-specific impacts of releases, soil concentrations were estimated via ambient air deposition from 1,2-dichloroethane TRI releasing facilities and via land application of biosolids from POTWs. Of these pathways, application of biosolids is estimated to result in lower concentrations of 1,2-dichloroethane (0.63 mg/kg) than deposition from ambient air deposition (2 mg/kg).

Monitoring data from the Water Quality Portal (WQP) shows that 1,2-dichloroethane is widespread in groundwater across the United States. Modeling results show that disposal of 1,2-dichloroethane also could be a source of 1,2-dichloroethane in groundwater. However, given limited areas where releases of 1,2-dichloroethane occur, the majority of 1,2-dichloroethane in groundwater is likely due to the anaerobic transformation to 1,2-dichloroethane from other chlorinated solvents contaminating groundwater.

3.3.4 Weight of Scientific Evidence Conclusions for Environmental Concentrations

Ambient Air Monitored and Modeled Concentrations

The Agency modeled ambient air concentrations from TRI- and NEI facility-reported releases as well as EPA-estimated releases from generic facilities/sites using AERMOD. The TRI and NEI data are reported by facilities and state/government entities and provide EPA with data on the level or 1,2-dichloroethane being released into ambient air.

AERMOD uses the latitude/longitude information reported by each facility to TRI as the location of the point of release. While this is generally a close approximation of the release point for a small facility, it might not represent the release point within a much larger facility. Therefore, there is some uncertainty associated with the modeled distances from each release point and the associated exposure concentrations to which the general population living proximity to releasing facilities might be exposed. The TRI-reported data used for AERMOD do not include source-specific stack parameters that can affect plume characterize and associated dispersion of the plume. Therefore, EPA used pre-defined stack parameters within the Integrated Indoor-Outdoor Air Calculator (IIOAC) to represent stack parameters of all facilities modeled using AERMOD. Those stack parameters include a stack height of 10 m above the ground with a 2-meter inside diameter, an exit gas temperature of 300 K, and an exit gas velocity of 5 m/s (see Table 6 of the IIOAC User Guide).

The above parameters were selected because they represent a slow-moving, low-to-the-ground plume with limited dispersion that results in a more conservative estimate of exposure concentrations at the distances evaluated. As such, these parameters might result in some overestimation of emissions for certain facilities modeled. Additionally, the assumption of a 10 m × 10 m area source for fugitive releases might impact the exposures estimates very near a releasing facility (*i.e.*, 10 m from a fugitive release). This assumption places the 10-meter exposure points just off the release point that might result in either an over or underestimation depending on other factors like meteorological data release heights, and plume characteristics. Facility-specific stack parameters were used in the modeling of NEI releases, when reported.

In addition, EPA also used meteorology data for Lake Charles, Louisiana, and Sioux Falls, South Dakota, for OESs that had EPA-estimated releases for generic facilities/sites where facility-specific data were not available. Sioux Falls and Lake Charles were chosen as two meteorological stations because they represent meteorological datasets that tend to provide central tendency and high-end concentration estimates relative to the other stations within IIOAC based on a sensitivity analysis of the average concentration and deposition predictions conducted in support of IIOAC development (see the *Draft Environmental Media Assessment for 1,2-Dichloroethane*(U.S. EPA, 2025af) for more details).

Contrary to TRI-reported data, NEI-reported data used for AEMOD include source-specific stack parameters. Therefore, specific parameter values were used in modeling, when available. When parameters were not available, and/or values were reported outside of normal bounds, reported values were replaced using procedures outlined in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af).

EPA has robust confidence in the use of AERMOD to model ambient air concentrations because AERMOD has been peer reviewed. EPA additionally has robust confidence in the use of facility-reported release data from TRI and NEI as model inputs. Furthermore, the use of both datasets ensures that all releases were likely captured in this analysis and the two databases, which have different reporting requirements, can be used in conjunction with each other to strengthen the overall confidence in modeled concentrations of 1,2-dichloroethane. Overall, EPA has robust confidence in the ambient air concentrations modeled using AERMOD when either NEI or TRI-reported releases were used as model inputs. The robust confidence is supported by the analysis showing the agreement of modeled and measured data as discussed in Section 7.1 of the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af). In contrast, the Agency has either slight or moderate confidence in the concentrations modeled using EPA-estimated releases from generic facilities/sites. The lower confidence for EPA-estimated releases is due to the uncertainty associated with the estimated releases and the lack of site-specific data available for generic facilities/sites.

Surface Water Pathway

EPA estimated 1,2-dichloroethane surface water concentrations based on facility-specfic releases as reported to TRI and DMR. In addition, EPA also utilized National Hydrography Dataset Plus (NHDPlus) flow database to provide site specific receiving water body flow metrics. EPA is confident that the surface water concentration estimates at the point of release are representative of site-specific conditions for environmental and human exposures.

Land Pathway (Soils, Groundwater, and Biosolids)

Current reported releases to landfills are not anticipated to result in measurable 1,2-dichloroethane groundwater concentrations; however, EPA did conduct a quantitative analysis of 1,2-groundwater due to poorly managed landfills. Uncertainties and limitations are inherent in the modeling of groundwater concentrations from disposing chemical substances into poorly managed Resource Conservation and Recovery Act (RCRA) Subtitle D landfills as well as those that are not regulated as closely. These uncertainties include, but are not limited to, (1) determining the total and leachable concentrations of waste constituents, (2) estimating the release of pollutants from the waste management units to the environment, and (3) estimating and transport of pollutants in a range of variable environments by process that often are not completely understood or are too complex to quantify accurately. To address some of these uncertainties and add strength to the assessment, EPA considered multiple loading rates and multiple leachate concentrations. These considerations add value to estimate exposure that falls at an unknown percentile of the full distribution of exposures. The Hazardous Waste Delisting Risk Assessment Software (DRAS) Model is based on a survey of drinking water wells located downgradient from a waste management unit (U.S. EPA, 1988). Due to the age of the survey, it is unclear how the survey represents current conditions and proximity of drinking water wells to disposal units. Similarly, it is not clear if the surveyed waste management units are representative of current waste management practices. Additionally, as discussed in the *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag), it is unlikely that 1,2-dichloroethane in landfill leachate is connected to TSCA uses. EPA therefore has moderate confidence in the accuracy of modeled estimates of 1,2-dichloroethane in groundwater from TSCA releases and that the modeled estimates are protective of human health.

Monitoring data from the WQP shows that low levels of 1,2-dichloroethane are widespread in wells across the United States. However, data from EPA sources such as CDR, TRI, and DMR, show that releases from COUs are not as geographically widespread; therefore, the 1,2-dichloroethane detected in groundwater is likely resulting from the transformation of other contaminating chlorinated solvents in groundwater rather than from identified releases. Because there is no evidence that the 1,2-dichloroethane in groundwater is from TSCA COU activities or releases, EPA did not assess 1,2-dichloroethane exposures from groundwater.

EPA identified limited monitoring data reporting concentrations of 1,2-dichloroethane in soil; however, the physical and chemical properties of 1,2-dichloroethane suggest that it might be present in soil. Therefore, EPA modeled soil concentrations via ambient air deposition from 1,2-dichloroethane TRI releasing facilities and via land application of biosolids from POTWs. EPA used SimpleTreat4.0, a modified equilibrium partitioning model, and an ECHA guidance document to estimate concentrations of 1,2-dichlorethane in biosolids (ECHA, 2016; RIVM, 2015). Although EPA is uncertain of the precision of the estimates of 1,2-dichloroethane concentrations in soils from biosolids land application, the Agency is highly confident that the low estimated concentrations from POTWs releasing 1,2-dichloroethane-containing biosolids when combined with the lack of 1,2-dichloroethane detected in EPA's national biosolids monitoring data result in a conclusion of negligible presence of 1,2-dichloroethane in biosolids applied to soil. To calculate concentrations of 1,2-dichloroethane in soil due to air deposition, EPA used AERMOD to estimate deposition rates from TRI reporting facilities. The Agency has moderate confidence in the modeled 1,2-dichloroethane air deposition results due to the moderate confidence in the input parameter values used for AERMOD deposition modeling (*e.g.*, cuticular uptake rate).

1498 # 4 ENVIRONMENTAL RISK ASSESSMENT

1,2-Dichloroethane – Environmental Risk Assessment (Section 4):
Key Points

EPA evaluated the reasonably available information to support environmental risk assessment of 1,2-dichloroethane. The key points of the draft environmental risk assessment are summarized below.

Environmental Exposure

- 1,2-Dichloroethane is expected to be released to air, water, and land.
    - Based on the fate and transport and environmental media analyses (Sections 1.2, and 3.3), the main environmental exposure pathways for 1,2-dichloroethane are surface water and air.
    - The contribution of air releases to exposure was assessed via air deposition to soil and water.

Environmental Hazard

- Aquatic Species
    - The acute aquatic and benthic concentration of concern (COC) of 11,909 µg/L was derived from the lower 95th percentile of the HC05 based on a species sensitivity distribution (SSD).
    - The chronic aquatic COC of 480 µg/L was derived from the chronic value (ChV) of the 21- and 28-day LOECs/NOECs for reproductive inhibition of adult *Daphnia magna*.
    - The algal COC of 124,000 µg/L was derived from the 72-hour EC50 for growth and development effects for *Raphidocelis subcapitata*.
    - The chronic COC for comparison with benthic pore water was 9,300 µg/L and the chronic COC for comparison with sediment was 2,900 µg/kg. Both COCs were derived from the analog 1,1,2-trichloroethane ChVs of two-generation LOECs/NOECs for growth and development effects for second generation *Chironomus riparius* larvae.
- Terrestrial Species
    - The mammalian wildlife TRV of 93 mg/kg-bw/day was derived from the geometric mean of NOAELs for reproduction and growth effects on human health model mice and rats.
    - The avian hazard threshold of 16 mg/kg-bw/day was derived from the geometric mean of 8.5 month NOAEL/LOAEL for reduced reproductive success in white leghorn chickens.
    - The terrestrial plant hazard threshold of 9,200 µg/L was derived from the 2-hour ED25 for germination effects for *Nicotiana tabacum*.

Environmental Risk

- EPA expects risk for acute and chronic durations of 1,2-dichloroethane exposure to aquatic organisms. Risk quotients (RQs) exceeding 1 were observed across all three media of exposure: surface water, benthic pore water, and sediment. Additionally, RQ values exceeding 1 were observed across taxonomic groups, representing aquatic non-vascular plants, invertebrates, and vertebrates. RQs exceeding 1 were observed for five COUs: (1) Manufacturing – domestic manufacture, (2) Processing – processing as a reactant, (3) Processing – recycling, (4) Industrial use/process regulator *e.g.*, catalyst moderator; oxidation inhibitor, and (5) Disposal.
    - The Agency has moderate to robust confidence in the preliminary determination of risk to aquatic organisms.
- EPA does not expect risk for any assessed pathways for exposure of 1,2-dichloroethane to terrestrial organisms. The COU with the highest soil and soil pore water concentrations (Manufacturing – domestic manufacture) was evaluated quantitatively for risk to terrestrial species from air deposition to soil. RQ values were below 1 for terrestrial plants exposed to 1,2-dichloroethane in soil pore water and for dietary exposure of 1,2-dichloroethane to representative mammals and birds via trophic transfer. The Agency has moderate confidence in the preliminary determination of no risk to terrestrial organisms.
- EPA does not expect risk for any assessed pathways for exposure of the assessed byproducts to aquatic and terrestrial organisms.
    - The Agency has moderate confidence in the preliminary determination of no environmental risk from the byproducts.

4.1 Summary of Environmental Exposures

Based on the fate and transport and environmental media analyses presented in Sections 2 and 3.3, the main environmental exposure pathways for 1,2-dichloroethane are surface water and air deposition. Inhalation is not expected to be a significant pathway. Air deposition to soil may result in exposure to terrestrial organisms via uptake from soil and soil pore water and subsequent trophic transfer. Although 1,2-dichloroethane exposure also occurs via land application of biosolids, the quantities are lower than the amount occurring from air deposition to soil (see Section 3.3.3) so this pathway was not assessed quantitatively.

Due to the low availability of biomonitoring data for exposure media or biota, exposures to aquatic and terrestrial species were assessed using modeled data and known maximum facility air and water releases of 1,2-dichloroethane for each COU/OES. Dietary exposure was assessed via trophic transfer which is the process by which chemical contaminants can be taken up by organisms through dietary and media exposures and transfer from one trophic level to another. Chemicals can be transferred from contaminated media and diet to biological tissue and accumulate throughout an organisms' lifespan (bioaccumulation) if they are not readily excreted or metabolized. Through dietary consumption of prey, a chemical can subsequently be transferred from one trophic level to another. If biomagnification occurs, higher trophic level predators will contain greater body burdens of a contaminant compared to lower trophic level organisms.

1,2-Dichloroethane is not expected to be bioaccumulative in tissues with a reported bioaccumulation factor [BAF] of 3.78 L/kg and bioconcentration factors [BCFs] ranging from 2 to 4.4 L/kg. 1,2-Dichloroethane is not expected to persist in aquatic surface water or sediments as it volatilizes from water (Henry's Law constant [HLC] = 1.54×10^{-3} atm-m^3/mol) unless release rates cause sediment concentrations to exceed biodegradation rates and high water solubility cause partitioning of releases to sediment pore water. 1,2-Dichloroethane may not persist in soil based on its HLC and vapor pressure (78.9 mm Hg). Although 1,2-dichloroethane is expected to have low degradation rates under most environmental conditions, it may be continuously released to the environment. Furthermore, measured concentrations of 1,2-dichloroethane have been reported in aquatic organism tissues. Based on these considerations, dietary exposure is a relevant route of exposure for wildlife.

Aquatic trophic transfer included the ingestion of fish and crayfish by mink (representative aquatic-dependent mammal) and belted kingfisher (representative aquatic-dependent bird). Terrestrial trophic transfer included the ingestion of plants by meadow vole and northern bobwhite (representative herbivores), ingestion of earthworms by short-tailed shrew and American woodcock (representative insectivores), and ingestion of the representative herbivores and representative insectivores by kestrel (representative avian predator).

The Disposal COU and the Manufacturing – domestic manufacture COU resulted in the highest media concentrations for the surface water pathway and the air deposition to soil pathway, respectively. Estimated surface water concentrations are 4,740 µg/L for a 250-day release scenario and 62,900 µg/L for a 21-day release scenario. Estimated soil and soil porewater concentrations for 95th percentile daily deposition at the 30 m distance are 1,982 µg/kg and 910 µg/L, respectively.

4.1.1 Weight of Scientific Evidence Conclusions for Environmental Exposures

EPA used a combination of chemical-specific parameters and generic default parameters when estimating surface water, sediment, soil, and fish-tissue concentrations.

Concentrations of 1,2-dichloroethane in environmental media are expected to vary by exposure scenario. Release from industrial facilities, either by water or air, contribute to concentrations of 1,2-dichloroethane in the environment. Proximity to facilities and other sources is likely to lead to elevated concentrations via air deposition compared to locations that are more remote. The ability to identify releases by location reduces uncertainty in assumptions when selecting model input parameters that are typically informed by location (*e.g.*, meteorological data, land cover parameters for air modeling, flow data for water modeling).

The available measured ambient surface water monitoring data for 1,2-dichloroethane are poorly co-located with 1,2-dichloroethane facility release sites and the corresponding facility's permit effluent monitoring data. Therefore, EPA relied primarily on facility-specific releases to surface waters as reported to EPA through NPDES permit databases to estimate aqueous concentrations. The estimated 1,2-dichloroethane surface water concentrations are based on effluent monitoring data, which are several orders of magnitude greater than concentrations reported in ambient surface water monitoring data. 1,2-Dichloroethane concentrations are estimated at the point of release based on facility's permit effluent monitoring data, whereas ambient surface water monitoring locations are neither spatially nor temporally aligned with known facility COU sites of release. For additional details, see Section 3.3.4 of this document and Section 7.2 of the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af). Environmental exposures of aquatic invertebrates, vertebrates, and plants to 1,2-dichloroethane were assessed using estimated surface water, benthic pore water, and sediment concentrations resulting from reported releases to surface water (Section 3.3.2) using site-specific information such as flow data for the receiving water body at a release location. The confidence in the estimated surface water, benthic pore water, and sediment concentrations resulting from surface water releases is characterized as moderate to robust. For additional details see Section 3.3.4.

There were no 1,2-dichloroethane soil monitoring data reflecting releases to air and deposition to soil found for comparison to modeled concentration estimates. Environmental exposures of soil invertebrates, terrestrial plants, and vertebrates to 1,2-dichloroethane were assessed using modeled air deposition of releases to soil and estimation of resulting bulk soil and soil porewater concentrations using conservative assumptions regarding persistence and mobility (Section 3.3.1). The screening level models and methods used to estimate soil concentrations from air deposition are commonly used, peer-reviewed methods. Thus, the confidence in the estimated soil concentrations resulting from air deposition is characterized as robust. For additional details see Section 3.3.4.

4.2 Summary of Environmental Hazards

4.2.1 Environmental Hazard Thresholds

EPA evaluated the reasonably available information for environmental hazard endpoints for aquatic and terrestrial species following exposure to 1,2-dichloroethane or its chemical analogs 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane in the *Draft Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ae). There were no reasonably available empirical data on acute exposures to sediment-dwelling species and there were limited empirical data on chronic exposures to sediment-dwelling species for 1,2-dichloroethane; thus, EPA supplemented with empirical data for the analogs 1,1-dichloroethane, 1,2-dichloropropane, and 1,1,2-trichloroethane.[8]

[8] EPA used the same approach to select these analogs as was used in the *Risk Evaluation for 1,1-Dichloroethane* to select analogs for use in the environmental hazard and risk assessment (U.S. EPA, 2025bj). This approach was peer reviewed by the SACC (see EPA-HQ-OPPT-2024-0114-0087).

Aquatic Species Hazard

To estimate aquatic hazards (mortality or immobilization) from acute exposures, the Agency supplemented empirical data on 1,2-dichloroethane aquatic species and empirical data on sediment-dwelling species on the analogs 1,1-dichloroethane and 1,2-dichloropropane with hazard predictions from an EPA predictive tool, Web-based Interspecies Correlation Estimation (Web-ICE). These data, which included toxicity predictions for a total of 80 species, were used with the empirical aquatic invertebrate, fish, and amphibian data and empirical sediment-dwelling invertebrate data to create a species sensitivity distribution (SSD) and calculate an HC05 (17,860 µg/L); that is, a hazardous concentration threshold for 5 percent of species (*i.e.*, hazard concentration that is protective of 95% of the species in the SSD). The concentration of concern (COC) of 11,909 µg/L for acute exposures of aquatic species was derived by using the lower 95th percentile of the HC05 to account for uncertainty, which is analogous to EPA's use of an adjustment factor (AF) for chronic and algal COCs.

EPA also calculated a COC of 480 µg/L (based on reproduction in *Daphnia magna*) for chronic exposures to aquatic species using empirical 1,2-dichloroethane hazard data. EPA calculated COCs for chronic exposures in benthic pore water and sediment to sediment-dwelling species (based on growth and development of *Chironomus riparius*; 9,300 µg/L in benthic pore water and 2,900 µg/kg in sediment) using empirical, sediment-dwelling invertebrate hazard data on an analog chemical, 1,1,2-trichloroethane.

EPA also calculated an algal COC of 12,400 µg/L for exposures to aquatic plants using empirical 1,2-dichloroethane hazard data on algae (based on growth of *Raphidocelis subcapitata*).

Table 4-1. Environmental Hazard Thresholds for Aquatic Environmental Toxicity

Environmental Aquatic Toxicity	Analog	Hazard Value (ppb)	Assessment Factor (AF)	COC (ppb)	Assessment Medium
Acute aquatic exposure: Lower 95% CI of HC05 from SSD	N/A	11,909	N/A[a]	11,909	Water column
Acute benthic exposure: Lower 95% CI of HC05 from SSD	1,1-Dichloroethane, 1,2-Dichloropropane	11,909	N/A[a]	11,909	Benthic pore water
Chronic aquatic exposure: daphnid ChV	N/A	4,800	10	480	Water column
Chronic benthic exposure: midge ChV	1,1,2-Trichloroethane	93,000	10	9,300	Benthic pore water
Chronic benthic exposure: midge ChV	1,1,2-Trichloroethane	29,000[b]	10	2,900[b]	Sediment
Aquatic plant exposure: algae EC50	N/A	124,000	10	12,400	Water column

AF = adjustment factor; ChV = chronic value; CI = confidence interval; COC = concentration of concern; EC50 = effect concentration at which 50% of test organisms exhibit an effect; HC05 = hazardous concentration for 5% of species; SSD = species sensitivity distribution

[a] EPA used the lower 95% CI of the HC05 to account for uncertainties rather than an adjustment factor.

[b] Values in µg/kg, otherwise, hazard values in µg/L.

Terrestrial Species Hazard

Terrestrial hazard data for 1,2-dichloroethane were available for mammals, birds, and plants. Empirical toxicity data for mice and rats were used to derive a chronic toxicity reference value (TRV) for terrestrial mammals of 93 mg/kg-bw/day (based on reproduction and growth). Based on empirical toxicity data for chickens (*Gallus gallus domesticus*) from a dietary study, the chronic hazard threshold for terrestrial birds is 16 mg/kg-bw/day based on reduced flock production. Based on empirical toxicity data for tobacco pollen exposed via gas injected into germination medium, the acute hazard threshold for terrestrial plants is 9.2 mg/L.

Table 4-2. Environmental Hazard Thresholds for Terrestrial Environmental Toxicity

Environmental Terrestrial Toxicity	Hazard Value or TRV	Assessment Medium
Mammal: TRV	93 mg/kg-bw/day	Dietary
Avian (*Gallus gallus domesticus*): ChV	16 mg/kg-bw/day	Dietary
Soil invertebrate	No data	No data
Terrestrial plant (*Nicotiana tabacum*): ED25	9.2 mg/L	Soil pore water

4.2.2 Weight of Scientific Evidence Conclusions for Environmental Hazards

EPA considered all reasonably available information identified through the systematic review process under TSCA to characterize environmental hazard endpoints for 1,2-dichloroethane. The following summarizes the hazard values and overall hazard confidence. For additional details, see the *Draft Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ae).

Aquatic Species

LC50 and EC50 values from eight exposures to 1,2-dichloroethane in aquatic invertebrates, amphibians, and fish and immobilization EC50 values from exposure to the analogs 1,1-dichloroethane and 1,2-dichloropropane in a benthic invertebrate species were used alongside Web-ICE-derived hazard estimates to develop an aquatic and benthic SSD. The lower confidence interval of the HC05 was used as the COC and indicated that acute aquatic toxicity occurs at 11,909 µg/L. EPA has robust confidence that this hazard value represents the level of acute 1,2-dichloroethane exposure at which ecologically relevant effects will occur in aquatic invertebrates and vertebrates.

Chronic aquatic effects were observed in aquatic invertebrates and fish. Reproduction inhibition in *D. magna* resulted from 21- and 28-day exposures to 1,2-dichloroethane. The COC based on these studies indicated that chronic toxicity to aquatic species occurs at 480 µg/L. EPA has robust confidence that this hazard value represents the level of chronic 1,2-dichloroethane exposure at which ecologically relevant effects will occur in aquatic species.

A 72-hour exposure to 1,2-dichloroethane in the green algae *Raphidocelis subcapitata* found a significant reduction in population growth. The COC based on this study indicated that toxicity in algae occurs at 12,400 µg/L. EPA has moderate confidence that this hazard value represents the level of 1,2-dichloroethane at which ecologically relevant effects will occur in algae because only one high-rated study testing one species was available in the database.

Benthic Species

An acute benthic COC of 11,909 µg/L was selected based on an aquatic and benthic SSD developed as described above. EPA has moderate confidence that this hazard value represents the level of acute benthic 1,2-dichloroethane exposure at which ecologically relevant effects will occur in benthic invertebrates.

A two-generation study in the freshwater midge *C. riparius* exposed to the analog 1,1,2-trichloroethane resulted in significantly decreased emergence in second-generation larvae. The COCs based on this study indicated that chronic toxicity occurs at 2,900 µg/kg in benthic invertebrates exposed via sediment and at 9,300 µg/L in benthic invertebrates exposed via benthic pore water. EPA has moderate confidence that these hazard values represent the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in benthic invertebrates, because hazard information for only two species was identified, and one of the studies was based on exposure to an analog rather than the target chemical.

Terrestrial Species

Subchronic and chronic exposure to 1,2-dichloroethane resulted in behavior, growth, reproduction, and mortality effects in rats and mice. The TRV derived from the dataset was ultimately set based on the geometric mean of the no-observed-adverse-effect levels (NOAELs) for reproduction and growth, which was 93 mg/kg-bw/day. EPA has moderate confidence that this hazard value represents the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial vertebrates, because no wildlife mammalian studies were available and exposure for the studies used to set the TRV was primarily via gavage, which is considered a less environmentally relevant form of exposure.

Chronic exposure to 1,2-dichloroethane resulted in effects on feed consumption and reproduction in chickens. The hazard value derived from this study indicated that chronic toxicity in terrestrial birds occurs at 16 mg/kg-bw/day. EPA has moderate confidence that this hazard value represents the level of 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial birds, because only a single study in a non-wildlife species was available in the database.

Acute exposure to 1,2-dichloroethane resulted in inhibition of germination in tobacco pollen. The hazard value derived from this study indicated that acute toxicity in terrestrial plants occurs at 9.2 mg/L. EPA has slight confidence that this hazard value represents the level of acute 1,2-dichloroethane exposure at which ecologically relevant effects will occur in terrestrial plants, because only one study in an agricultural crop species was represented in the database and the exposure route was via growth medium, which could be considered less environmentally relevant than tests conducted in soil.

4.3 Environmental Risk Characterization

EPA considered fate, exposure, and environmental hazard to characterize the environmental risk of 1,2-dichloroethane. For environmental receptors, the Agency quantitatively estimated risks to (1) aquatic species via water and sediment (including benthic pore water and sediment), and (2) terrestrial species via exposure to soil and soil pore water by air deposition and diet through trophic transfer. Risk estimates to aquatic-dependent terrestrial species were conducted to include exposures to 1,2-dichloroethane via diet, water, and incidental ingestion of sediment. As described in Section 2.2, when released to the environment, 1,2-dichloroethane is expected to partition primarily to air with lesser amounts to water, sediment and soil. Based on its physical and chemical properties, 1,2-dichloroethane may persist in the environment when releases exceed volatilization and biodegradation rates (Table 2-2) but is not expected to bioaccumulate in biota (BAF = 3.78 L/kg; BCF = 2–4.4 L/kg). Direct exposure of 1,2-dichloroethane to terrestrial receptors via air was not assessed quantitatively because dietary exposure was determined to be the driver of exposure to wildlife. In general, for terrestrial mammals and birds, relative contribution to total exposure associated with inhalation is secondary in comparison to exposures by diet and indirect ingestion. EPA has quantitatively evaluated the relative contribution of inhalation exposures for terrestrial mammals and birds in the *Guidance for Developing Ecological Soil Screening Levels* (Eco-SSLs) (U.S. EPA, 2005, 2003).

Section 4.2 details reasonably available environmental hazard data and indicates that 1,2-dichloroethane presents hazard to aquatic and terrestrial organisms. For acute exposures, 1,2-dichloroethane is a hazard to aquatic animals in the water column and benthic pore water at 11,909 µg/L based on the lower 95 percent confidence interval of the HC05 resulting from SSDs utilizing EPA's Web-ICE (Raimondo and Barron, 2010) and SSD toolbox applications (Etterson, 2020). For chronic exposures, 1,2-dichloroethane is a hazard to aquatic organisms in the water column with a ChV of 480 µg/L for fish. For exposures to algal species, 1,2-dichloroethane is a hazard to algae in the water column with a ChV of 124,000 µg/L. For chronic exposures to sediment-dwelling organisms, 1,2-dichloroethane is a hazard with ChVs of 9,300 µg/L and 2,900 µg/kg in benthic pore water and sediment, respectively. For terrestrial exposures, 1,2-dichloroethane is a hazard to (1) mammals at 93 mg/kg-bw/day, (2) birds at 16 mg/kg-bw/day, and (3) terrestrial plants with a hazard value of 9,200 µg/L. As detailed in Section 4.2.2, EPA considers the evidence for aquatic hazard thresholds robust, algal thresholds as moderate, benthic/sediment thresholds as moderate, terrestrial mammalian threshold moderate, terrestrial avian threshold moderate, and the evidence for terrestrial plants threshold slight.

Facility emissions data were obtained from databases such as TRI, DMR, and the NEI. The emissions data from these sources are the facility-specific releases of 1,2-dichloroethane to air, water, and land on an annual basis (lb/site-yr or kg/site-yr). The total number of operating days per year for these facilities can be confidently estimated (Section 3.2.1.1). For example, manufacturing processes are typically continuous process that run year-round with potential brief shut-down periods. The total number of operating days per year for manufacturing processes can be reliably estimated as 350. However, the number of days per year that the site manufactures, processes, or uses and releases the chemical is uncertain. The number of release days per year may be less than the total number of operating days for the facility. To address this uncertainty, EPA has modeled two distinct "what-if" scenarios for releases to surface water to cover a range of possible release days at the facility. One scenario assumes the number of release days is equivalent to the shortest hazard duration from which the chronic COCs were derived (21 days). A second scenario assumes that the release is averaged out over the total number of operating days (Table 3-5), so an equal average daily release occurs on each of the operating days. Exposure concentrations from both scenarios were compared to the acute, algal, and chronic COCs.

4.3.1 Risk Assessment Approach

EPA conducted the environmental risk characterization for 1,2-dichloroethane to evaluate whether the releases of 1,2-dichloroethane to air, water, and land and subsequent exposures to aquatic and terrestrial species exceeds the concentrations of 1,2-dichloroethane observed to cause hazardous effects in aquatic and terrestrial species. The Agency quantitatively estimated risks to aquatic species via water and sediment (including benthic pore water and sediment), and to terrestrial species via exposure to soil and soil pore water and diet through trophic transfer. A weight of evidence approach was used to select hazard thresholds for use in the derivation of risk quotients for aquatic and terrestrial organisms.

EPA characterized environmental risk of 1,2-dichloroethane by calculating risk quotients (RQs) for quantitative assessments (U.S. EPA, 1998; Barnthouse et al., 1982). The RQ is defined in Equation 4-1 below.

Equation 4-1. Calculating the Risk Quotient (RQ)

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

Environmental concentrations for each compartment (*i.e.*, surface water, sediment, and soil) were based on modeled (*e.g.*, VVWM-PSC, AERMOD) and/or calculated (*i.e.*, soil and soil pore water concentrations estimated from AERMOD-modeled air deposition rates) concentrations of 1,2-dichloroethane from Sections 3.3 and 4.1. Exposure concentrations in the water column, benthic pore water, and sediment were determined according to two different release scenarios[9]: Scenario 1, a hazard based-release duration; and Scenario 2, which averaged the release across the total number of facility operating days. Days of exceedance information was used to determine whether the exposure concentrations resulting from these release scenarios exceeded the COCs for a relevant length of time. For aquatic species dwelling in the water column, acute RQ days of exceedance were determined as equal to or greater than 1 day, whereas for chronic RQs days of exceedance are equal to or greater than 21 days. RQs for algal species are presented separately and neither described as acute or chronic due to the relatively rapid replication time of most algal species. Algal RQs days of exceedance are equal to or greater than 3 days. For sediment-dwelling species, acute RQ days of exceedance were determined as equal to or greater than 1 day, whereas for chronic RQs days of exceedance are equal to or greater than 35 days. The days of exceedance for the algal and chronic COCs are based on the exposure durations from the associated hazard studies.

EPA calculates hazard thresholds to identify potential concerns to aquatic and terrestrial species. These terms describe how the values are derived and can encompass multiple taxa or ecologically relevant groups of taxa as the environmental risk characterization serves populations of organisms within a wide diversity of environments. For hazard thresholds, EPA used the COCs calculated for aquatic organisms, and the hazard values or TRVs calculated for terrestrial organisms as detailed within Section 4.2.1.

RQs equal to 1 indicate that environmental exposures are the same as the hazard threshold. If the RQ is above 1, the exposure is greater than the hazard threshold and risk is indicated. If the RQ is below 1, the exposure is less than the hazard threshold and risk is not indicated. RQs derived from modeled data for 1,2-dichloroethane are described in Section 4.3.2 for aquatic organisms and Sections 4.3.3 and 4.3.4 for terrestrial organisms.

Aquatic Risk Characterization Approach; Surface Water, Benthic Pore Water, and Sediment

Quantitative risk estimates for nine COUs/five OESs were developed for releases of 1,2-dichloroethane to surface water. Within the aquatic environment, a tiered approach was employed. Surface water releases were first assessed using methodologies based on EPA's Exposure and Fate Assessment Screening Tool (E-FAST) by comparing surface water concentrations resulting from a 21-day release scenario to the most sensitive COC—the chronic water-column COC of 480 µg/L. Facilities and associated COUs/OESs with RQs exceeding 1 from the first tier estimated concentrations then proceeded to second tier modeling in the Variable Volume Water Model in Point Source Calculator (VVWM-PSC, Table 4-3).

VVWM-PSC considers model inputs of physical and chemical properties of 1,2-dichloroethane (*i.e.*, K_{OW}, K_{OC}, water column half-life, photolysis half-life, hydrolysis half-life, and benthic half-life) allowing EPA to model predicted benthic pore water and sediment concentrations. The VVWM-PSC modeled 7Q10 surface water concentrations from facility-specific release pollutant loads. If the 7Q10 surface water concentrations corresponding to the respective exposure durations represented by the various COCs exceeded the acute, chronic, or algal COCs in the water column, the VVWM-PSC Model was then used to confirm the modeled surface water concentration days of exceedance as determined by

[9] This approach is similar to approaches used in prior peer-reviewed risk evaluations including the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj). The SACC was supportive of including a conservative release duration scenario due to data availability constraints (EPA-HQ-OPPT-2024-0114-0087).

the respective COCs. For example, for 1,2-dichloroethane, five COUs modeled in VVWM-PSC produced aquatic chronic RQ values greater than or equal to 1 based on Scenario 1 (number of release days based on chronic hazard study durations), prompting the days of exceedance analysis in VVWM-PSC. Similarly, if modeled benthic pore water and sediment concentrations corresponding to the respective exposure durations exceeded the benthic COCs, the VVWM-PSC Model was used to confirm the modeled benthic pore water and sediment concentration days of exceedance as determined by those COCs.

Table 4-3. Occurrence of Releases to Surface Water per COU/OES and Associated Risk Estimation Decisions

COU (Lifecycle Stage/Category/Subcategory)	OES	Releases to Surface Water	Tier I RQ > 1	Tier II Conducted
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Yes	Yes	Yes
Manufacturing/Import/Import	Repackaging	Yes	No	No
Processing/Repackaging/Repackaging				
Processing/Processing – as a reactant/Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	Yes	Yes	Yes
Processing/Recycling/Recycling				
Industrial Use/Process regulator/*e.g.*, Catalyst moderator; oxidation inhibitor				
Processing/Processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	Yes	Yes	Yes
Processing/Processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing				
Processing/Processing – incorporated into formulation, mixture, or reaction product/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing				
Industrial Use/Other use/Process solvent				
Distribution in Commerce/Distribution in commerce/Distribution in commerce	Distribution in commerce	No	N/A	N/A
Industrial Use/Adhesives and sealants/Adhesives and sealants	Industrial application of adhesives and sealants	No	N/A	N/A
Industrial Use/Functional fluids (closed systems)/Heat transferring agent	Heat transferring agent	No	N/A	N/A

COU (Lifecycle Stage/Category/Subcategory)	OES	Releases to Surface Water	Tier I RQ > 1	Tier II Conducted
Industrial Use/Lubricants and greases/Solid film lubricants and greases	Industrial application of lubricants and greases	No	N/A	N/A
Industrial Use/Solvents (for cleaning and degreasing)/Degreasing and cleaning solvents	Commercial aerosol products	No	N/A	N/A
	Non-aerosol cleaning and degreasing	Yes	No	No
Commercial Use/Plastic and rubber products/Products such as: plastic and rubber products	Plastic and rubber products	No	N/A	N/A
Commercial Use/Fuels and related products/Fuels and related products	Fuels and related products	No	N/A	N/A
Commercial Use/Other use/Laboratory chemical	Laboratory use	Yes	No	No
Disposal/Disposal/Disposal	Waste handling, treatment and disposal (landfill)	Yes	No	No
	Waste handling, treatment, and disposal (POTW)	Yes	Yes	Yes
	Waste handling, treatment, and disposal (remediation)	Yes	No	No
	Waste handling, treatment, and disposal (non-POTW WWT)	Yes	No	No
	Waste handling, treatment, and disposal (incinerator)	Yes	Yes	Yes
N/A	Unknown[a]	Yes	No	No

[a] Some 1,2-dichloroethane-releasing facilities have not been mapped to an OES. The first tier of screening for those facilities indicated that resulting water concentrations did not exceed aquatic concentrations of concern.

Terrestrial Risk Characterization Approach

Risk to terrestrial species was assessed from exposure to 1,2-dichloroethane in soil and soil pore water resulting from air deposition. As described in Section 3.3, AERMOD was used to estimate the release of 1,2-dichloroethane to soil via air deposition from specific exposure scenarios. Estimated concentrations of 1,2-dichloroethane that could be in soil via air deposition 10 to 10,000 m from facility sources have been calculated for 1,2-dichloroethane releases reported to TRI in stack and fugitive emissions. EPA selected a distance of 30 m for evaluating 1,2-dichloroethane exposure to terrestrial organisms that could result from air deposition because this was the distance that resulted in the highest average daily deposition rate of 1,2-dichloroethane (U.S. EPA, 2025af). Soil and soil pore water concentrations were obtained using maximum 95th percentile daily air deposition rates of 1,2-dichloroethane (U.S. EPA, 2025af). EPA calculated RQs for exposure of terrestrial plants to 1,2-dichloroethane by directly comparing the 1,2-dichloroethane soil pore water concentrations to the terrestrial plant hazard value for 1,2-dichloroethane (Table 4-7).

4.3.1.1 Risk Assessment Approach for Trophic Transfer

EPA conducted screening level approaches for aquatic and terrestrial risk estimation based on exposure via trophic transfer using conservative assumptions for factors such as area use factor and 1,2-dichloroethane absorption from diet, soil, sediment, and water. A screening level analysis was conducted for trophic transfer and formulation of RQ values for aquatic and terrestrial pathways to representative mammalian and avian species. If RQ values were greater than or equal to 1, further refined analysis was warranted. If an RQ value is less than 1, no further assessment is necessary. The screening level approach employs a combination of conservative assumptions (*i.e.*, conditions for several exposure factors included within Equation 4-2 below) and utilization of the maximum values obtained from modeled and/or monitoring data from relevant environmental compartments.

Equation 4-2.

$$RQ_j = \frac{DE_j}{HT_j}$$

Where:

RQ_j = Risk quotient for contaminant (j) (unitless)
DE_j = Dietary exposure for contaminant (j) (mg/kg-bw/day)
HT_j = Hazard threshold (mg/kg-bw/day)

Dietary exposure estimates are presented in the *Draft Environmental Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ad). Terrestrial hazard data are available for mammals and birds using hazard values detailed in Section 4.2. As described in Section 4.1, representative mammal and bird species were chosen to connect the 1,2-dichloroethane transport exposure pathway via trophic transfer of 1,2-dichloroethane uptake from contaminated soil and soil pore water to earthworm. This is followed by consumption by an insectivorous mammal (short-tailed shrew) or insectivorous bird (woodcock) that were then consumed by a carnivorous bird (kestrel). Also considered was 1,2-dichloroethane uptake from contaminated soil pore water to plant (*Trifolium* sp.) followed by consumption by an herbivorous mammal (meadow vole) and then a herbivorous bird (northern bobwhite) that were then consumed by a carnivorous bird (kestrel). For aquatic-dependent terrestrial species, a representative mammal (American mink) and representative bird (belted kingfisher) were chosen to connect the 1,2-dichloroethane transport exposure pathway via trophic transfer from fish or crayfish uptake of 1,2-dichloroethane from contaminated surface water and benthic pore water modeled from 1,2-dichloroethane surface water releases.

4.3.2 Risk Estimates for Aquatic Species

RQ values exceeding 1 were observed for five COUs for surface water, two COUs for benthic pore water, and five COUs for sediment. All RQ values were calculated using media concentrations estimated via VVWM-PSC. The following four COUs with modeled VVWM-PSC concentrations did not result in any RQ values exceeding 1:

- Processing/processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing;
- Processing/processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing;

- Processing/processing – incorporated into formulation, mixture, or reaction product/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing; and
- Industrial use/other use/process solvent.

Although 1,2-dichloroethane's high water solubility (Table 2-1) and low log K_{OC} (Table 2-2) indicate biota in the water column are more likely to be exposed to 1,2-dichloroethane than biota in the sediment, RQ values execcding 1 were observed across all three media of exposure (surface water, benthic pore water, and sediment); this is likely due to the high production volume of 1,2-dichloroethane. Additionally, RQ values exceeding 1 were observed across taxonomic groups, representing aquatic non-vascular plants, invertebrates, and vertebrates. There is uncertainty about the actual number of days of release. Since EPA lacks information on estimated days of 1,2-dichloroethane release to surface waters for each COU/OES, a chronic hazard study-based duration was assumed as a 21-day lower-end release duration (Scenario 1), and the total number of facility operating days was assumed as the maximum release duration (Scenario 2) to bound this uncertainty. However, it is likely that actual days of release of 1,2-dichloroethane to surface waters (and thereby refined RQ values) for each COU/OES falls somewhere in between these two release duration scenarios.

Most instances where RQ values exceeded 1 correlated to conservative Release Scenario 1 (21-day hazard-based release duration scenario), whereas for Release Scenario 2 (total facility operating days per year-based release duration scenario), only chronic COCs resulted in RQ values exceeding 1. This is because the shorter release duration (Scenario 1) results in higher media concentrations than the longer release duration (Scenario 2) as the total annual release volume is divided across the number of days of release and the chronic aquatic COC (480 µg/L) and chronic sediment COC (2,900 µg/kg) are the lowest COCs. For two COUs (Manufacturing – domestic manufacture and Disposal), both Release Scenario 1 and Release Scenario 2 result in RQ values exceeding 1 for both the water column chronic COC and the sediment chronic COC (Table 4-4 and Table 4-7). For byproducts, surface water concentrations were calculated as described in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l) and compared to the most sensitive aquatic COC for each byproduct. The resulting RQ values are less than 1 for all evaluated byproducts. Thus, no risk is expected from exposure of the byproducts to aquatic species. Results are presented in detail per COU/OES in Table 4-4, Table 4-5, Table 4-6, Table 4-7, and Table 4-8.

Table 4-4. Environmental RQs by COU for Aquatic Organisms with 1,2-Dichloroethane Surface Water Concentrations Modeled by VVWM-PSC

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Surface Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	6/22	21	231	57,000	Acute	11,909	21	4.8
			350	14	3,380	Acute	11,909	0	0.28
			21	231	57,000	Chronic	480	21	119
			350	14	3,380	Chronic	480	349	7.0
Processing/Processing – as a reactant/Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	2/11	21	11	6,640	Acute	11,909	0	0.56
Processing/Recycling/Recycling			350	0.65	387	Acute	11,909	0	3.2E−02
Industrial Use/Process regulator/*e.g.*, Catalyst moderator; oxidation inhibitor			21	11	6,640	Chronic	480	21	14
			350	0.65	387	Chronic	480	0	0.81
Processing/Processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	0/13	21	5.0E−03	278	Acute	11,909	0	2.3E−02
Processing/Processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing			250	4.2E−04	21	Acute	11,909	0	1.7E−03
Processing/Processing – incorporated into formulation, mixture, or reaction product/Adhesives and sealants; lubricants and greases; process			21	5.0E−03	278	Chronic	480	0	0.58

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Surface Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing									
Industrial Use/Other use/Process solvent			250	4.2E−04	21	Chronic	480	0	4.3E−02
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	2/2	21	17	62,900	Acute	11,909	22	5.3
			250	1.4	4,740	Acute	11,909	0	0.40
			21	17	62,900	Chronic	480	24	131
			250	1.4	4,740	Chronic	480	250	10
	Waste handling, treatment, and disposal (POTW)	1/10	21	0.54	37,400	Acute	11,909	67	3.1
			365	3.1E−02	2,310	Acute	11,909	0	0.19
			21	0.54	37,400	Chronic	480	99	78
			365	3.1E−02	2,310	Chronic	480	156	4.8

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; RQ = risk quotient; SSD = species sensitivity distribution; VVM-PSC = Variable Volume Water Model – Point Source Calculator

[a] Number of facilities for a given OES with RQ ≥ 1 and relevant days of exceedance / total number of facilities for a given OES.

[b] Highest days of release for each COU/OES based on total number of facility operating days.

[c] Based on facility release data.

[d] Surface water concentration represents the maximum surface water concentration over a 21-day or total number of operating day average period corresponding with the acute aquatic or chronic aquatic COC used for the RQ estimate.

[e] Based on the lower 95% CI of the SSD HC05 (acute) developed from empirical hazard data from *A. gracile*, *A. salina*, *D. magna*, *L. pipiens*, *O. mykiss*, and *P. promelas* exposed to 1,2-dichloroethane in water, *C. riparius* exposed to 1,1-dichloroethane and 1,2-dichloropropane in water, and Web-ICE predictions generated from empirical 1,2-dichloroethane studies or (chronic) 21- and 28-day hazard data from *D. magna* exposed to 1,2-dichloroethane in water.

[f] Days per year that the exposure concentration exceeds the COC.

Table 4-5. Environmental RQs by COU for Aquatic Non-Vascular Plants with 1,2-Dichloroethane Surface Water Concentrations Modeled by VVWM-PSC

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Surface Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	1/22	21	231	57,000	Algal	12,400	21	4.6
			350	14	3,380			0	0.27
Processing/Processing – as a reactant/Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	0/11	21	11	6,640	Algal	12,400	0	0.54
Processing/Recycling/Recycling			350	0.65	387			0	3.1E−02
Industrial Use/Process regulator/*e.g.*, Catalyst moderator; oxidation inhibitor									
Processing/Processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	0/13	21	5.0E−03	278	Algal	12,400	0	2.2E−02
Processing/Processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing									
Processing/Processing – incorporated into formulation, mixture, or reaction			250	4.2E−04	21			0	1.7E−03

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Surface Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
product/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing									
Industrial Use/Other use/Process solvent									
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	1/2	21	17	62,900	Algal	12,400	22	5.1
			250	1.4	4,740			0	0.38
	Waste handling, treatment, and disposal (POTW)	1/10	21	0.54	37,400	Algal	12,400	66	3.0
			365	3.1E−02	2,310			0	0.19

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; RQ = risk quotient; SSD = species sensitivity distribution; VVM-PSC = Variable Volume Water Model – Point Source Calculator

[a] Number of facilities for a given OES with RQ ≥ 1 with relevant days of exceedance / Total number of facilities for a given OES.

[b] Highest days of release for each COU/OES based on total number of operating days.

[c] Based on facility release data.

[d] Surface water concentration represents the maximum surface water concentration over a 21-day or total number of operating day average period corresponding with the algal COC used for the RQ estimate.

[e] Based on 3-day hazard data from *R. subcapitata* exposed to 1,2-dichloroethane in water.

[f] Days per year that the exposure concentration exceeds the COC.

Table 4-6. Environmental RQs by COU for Sediment-Dwelling Organisms with 1,2-Dichloroethane Benthic Pore Water Concentrations Modeled by VVWM-PSC

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Benthic Pore Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	1/22	21	231	15,300	Acute	11,909	29	1.3
			350	14	3,260	Acute	11,909	0	0.27
			21	231	15,300	Chronic	9,300	47	1.6
			350	14	3,260	Chronic	9,300	0	0.35
Processing/Processing – as a reactant/Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	0/11	21	11	1,780	Acute	11,909	0	0.15
Processing/Recycling/Recycling			350	0.65	374	Acute	11,909	0	3.1E−02
Industrial Use/Process regulator/*e.g.*, Catalyst moderator; oxidation inhibitor			21	11	1,780	Chronic	9,300	0	0.19
			350	0.65	374	Chronic	9,300	0	4.0E−02
Processing/Processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	0/13	21	5.0E−03	111	Acute	11,909	0	9.3E−03
Processing/Processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing			250	4.2E−04	19	Acute	11,909	0	1.6E−03

COU (Life Cycle Stage/Category/Subcategory)	OES	Number of Facilities[a]	Days of Release[b]	Pollutant Load (kg/day) [c]	Benthic Pore Water Concentration (µg/L) [d]	COC Type	COC (µg/L) [e]	Days of Exceedance (days per year) [e f]	RQ
Processing/Processing – incorporated into formulation, mixture, or reaction product/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing			21	5.0E−03	111	Chronic	9,300	0	1.2E−02
Industrial Use/Other use/Process solvent			250	4.2E−04	19	Chronic	9,300	0	2.1E−03
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	1/2	21	17	17,200	Acute	11,909	38	1.4
			250	1.4	4,090	Acute	11,909	0	0.34
			21	17	17,200	Chronic	9,300	55	1.8
			250	1.4	4,090	Chronic	9,300	0	0.44
	Waste handling, treatment, and disposal (POTW)	1/10	21	0.54	16,900	Acute	11,909	72	1.4
			365	3.1E−02	2,290	Acute	11,909	0	0.19
			21	0.54	16,900	Chronic	9,300	93	1.8
			365	3.1E−02	2,290	Chronic	9,300	0	0.25

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; RQ = risk quotient; SSD = species sensitivity distribution; VVM-PSC = Variable Volume Water Model – Point Source Calculator

[a] Number of facilities for a given OES with RQ ≥ 1 with relevant days of exceedance / Total number of facilities for a given OES.

[b] Highest days of release for each COU/OES based on total number of operating days.

[c] Based on facility release data.

[d] Benthic pore water concentration represents the maximum benthic pore water concentration over a 21-day or total number of operating day average period corresponding with the acute benthic or chronic benthic COC used for the RQ estimate.

[e] Based on (acute) probabilistic hazard threshold (*e.g.*, lower bound of the 95th confidence interval of the HC05) based on empirical hazard data from *A. gracile, A. salina, C. riparius, D. magna, L. pipiens, O. mykiss, and P. promelas* exposed to 1,2-dichloroethane in water and Web-ICE predictions or (chronic) 35-day hazard data from sediment-dwelling *C. riparius* exposed to analogue 1,1,2-trichloroethane in pore water.

[f] Days per year that the exposure concentration exceeds the COC.

Table 4-7. Environmental RQs by COU for Sediment-Dwelling Organisms with 1,2-Dichloroethane Sediment Concentrations Modeled by VVWM-PSC

COU (Life Cycle/Stage/Category/ Subcategory)	OES	Number of Facilities [a]	Days of Release [b]	Pollutant Load (kg/day) [c]	Sediment Concentration (µg/kg) [d]	COC Type	COC (µg/kg)[e]	Days of Exceedance (days per year) [e f]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	1/22	21	231	41,700	Chronic	2,900	181	14
			350	14	8,890			364	3.1
Processing/Processing – as a reactant/Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	1/11	21	11	4,860	Chronic	2,900	48	1.7
Processing/Recycling/Recycling			350	0.65	1,020			0	0.35
Industrial Use/Process regulator/*e.g.*, Catalyst moderator; oxidation inhibitor									
Processing/Processing – incorporated into formulation, mixture, or reaction product/Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	0/13	21	5.0E−03	303	Chronic	2,900	0	0.10
Processing/Processing – incorporated into formulation, mixture, or reaction product/Processing aids: specific to petroleum production; plastics material and resin manufacturing									
Processing/Processing – incorporated into formulation, mixture, or reaction product/Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing			250	4.2E−04	53			0	1.8E−02
Industrial Use/Other use/Process solvent									

COU (Life Cycle/Stage/Category/ Subcategory)	OES	Number of Facilities [a]	Days of Release [b]	Pollutant Load (kg/day) [c]	Sediment Concentration (µg/kg) [d]	COC Type	COC (µg/kg)[e]	Days of Exceedance (days per year) [e f]	RQ
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	2/2	21	17	46,800	Chronic	2,900	189	16
			250	1.4	11,200			321	3.9
	Waste handling, treatment, and disposal (POTW)	1/10	21	0.54	46,100	Chronic	2,900	236	16
			365	3.1E−02	6,240			198	2.2

COC = concentration of concern; COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; RQ = risk quotient; SSD = species sensitivity distribution; VVM-PSC = Variable Volume Water Model – Point Source Calculator

[a] Number of facilities for a given OES with RQ ≥ 1 and relevant days of exceedance / Total number of facilities for a given OES.

[b] Highest days of release for each OES based on total number of facility operating days.

[c] Based on facility release data.

[d] Sediment concentration represents the maximum sediment concentration over a 21-day or total number of operating day average period corresponding with the chronic benthic COC used for the RQ estimate.

[e] Based on 35-day hazard data from *C. riparius* exposed to 1,1,2-trichloroethane in sediment.

[f] Days per year that the exposure concentration exceeds the COC.

Table 4-8. Aquatic Ecological Species Risk Screen for Estimated Byproduct Concentrations in Receiving Water Body

Chemical/ Byproduct	Daily Release (kg/day)	Days of Release (days)	Receiving Waterbody (Bayou D'Inde) 7Q10 Flow (mld[a])	Chemical Concentration in Receiving Water[b] (µg/L)	Ecological Chronic Concentration of Concern (µg/L) [c]	Risk Screen (RQ ≥ 1)
1,1-Dichloroethane	5.1E−02	350	4.04	13	93	0.14
Trichloroethylene	2.3E−04	350	4.04	6.0E−02	3	2.0E−02
Perchloroethylene	4.2E−03	350	4.04	1.0	50	2.1E−02
Methylene chloride	2.3E−03	350	4.04	0.56	90	6.2E−03
Carbon tetrachloride	4.2E−03	350	4.04	1.0	3	0.35

[a] Westlake Eagle2 Manufacturing facility receiving water body (Bayou d'Inde) 7Q10 flow (7 consecutive days of lowest flow over a 10-year period); mld = million liters per day
[b] Estimated concentration in receiving water body (Bayou d'Inde).
[c] Chemical-specific aquatic concentration of concern (see *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l)).

4.3.3 Risk Estimates for Terrestrial Species

1,2-Dichloroethane

The COU that resulted in the highest 1,2-dichloroethane soil pore water concentration (Manufacturing – domestic manufacture) was assessed to screen risk to terrestrial plants. Soil pore water concentrations resulting from air deposition to soil from TRI-reported fugitive emissions of 1,2-dichloroethane were calculated using the highest AERMOD prediction for daily air deposition to soil at 30 m from the facility. The resultant RQ for terrestrial plants was less than 1 (Table 4-9). Additionally, soil pore water concentrations from releases to soil via biosolid land application were lower than the concentrations presented in Table 4-9; therefore, it is expected that no COU results in an RQ exceeding 1 for terrestrial plants exposed to soil pore water via either the air deposition pathway or the land release pathway.

Byproducts

No risk is expected from byproduct exposure to terrestrial species based on the previous risk evaluations. No risk was observed for terrestrial species in the 1,1-dichloroethane risk evaluation, which is the only risk evaluation of the byproduct chemicals that quantitatively assessed risk to terrestrial species. Trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride determined in their respective risk evaluations that there was no terrestrial exposure pathway based on the physical and chemical and fate properties of each chemical. Additionally, no risk is expected from the assessed byproducts as these chemicals possess similar physical chemical and fate properties to 1,1-dichloroethane and are volatile chemicals that are not expected to be bioaccumulative.

Table 4-9. Calculated RQ for Terrestrial Plants Based on Modeled Air Deposition of 1,2-Dichloroethane

COU (Life Cycle Stage/Category/ Subcategory)	OES	Source	Number of Facilities	Soil Pore Water Concentration (µg/L) at 30 m[a]	Hazard Threshold (µg/L) [b]	RQ
Manufacturing/ Domestic manufacture/ Domestic manufacture	Manufacturing	TRI	25	910	9,200	0.10

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory

[a] Soil pore water concentrations calculated from estimated soil catchment concentrations that could be in soil via maximum daily air deposition (95th percentile) of 1,2-dichloroethane at a distance of 30 m from facility based on releases reported to TRI.

[b] Based on hazard data from tobacco (*Nicotiana tabacum*) exposed to 1,2-dichloroethane for 2 hours in growth medium.

4.3.4 Risk Estimates Based on Trophic Transfer in the Environment

Trophic transfer of 1,2-dichloroethane and potential risk to terrestrial species was evaluated using a screening level approach conducted as described in the EPA's *Guidance for Developing Ecological Soil Screening Levels* (U.S. EPA, 2005). 1,2-Dichloroethane concentrations within biota and resulting RQ values for the COUs/OESs with the highest environmental concentrations in soil, soil pore water, surface water, and sediment are presented below (Table 4-10, Table 4-11, Table 4-12, and Table 4-13). RQs were below 1 for representative species exposed to 1,2-dichloroethane through trophic transfer via soil and soil pore water based on the mammalian TRV, calculated using empirical toxicity data with mice and rats, and the avian hazard threshold, determined using empirical toxicity data with chickens.

Table 4-10. RQs for Screening Level Trophic Transfer of 1,2-Dichloroethane from Air Deposition in Insectivorous Terrestrial Ecosystems Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/Subcategory)	OES	Organism	Concentration in Biota (mg/kg/day)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [a]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Short-tailed shrew (*Blarina brevicauda*)	1.7	93	1.9	2.0E−02
		American woodcock (*Scolopax minor*)	2.6	16	2.7	0.17
		American kestrel (*Falco sparverius*)	2.2	16	2.3	0.14

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory
[a] Dietary exposure to 1,2-dichloroethane includes consumption of biota, incidental ingestion of soil, and ingestion of water.

Table 4-11. RQs for Screening Level Trophic Transfer of 1,2-Dichloroethane from Air Deposition in Herbivorous Terrestrial Ecosystems Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/Subcategory)	OES	Organism	Concentration in Biota (mg/kg/day)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [a]	RQ
Manufacturing/Domestic manufacture/Domestic manufacture	Manufacturing	Meadow vole (*Microtus pennsylvanicus*)	0.33	93	0.52	5.6E−03
		Northern bobwhite (*Colinus virginianus*)	0.10	16	0.21	1.3E−02
		American kestrel (*Falco sparverius*)	0.18	16	0.28	1.8E−02

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory
[a] Dietary exposure to 1,2-dichloroethane includes consumption of biota, incidental ingestion of soil, and ingestion of water.

Table 4-12. RQ Based on Potential Trophic Transfer of 1,2-Dichloroethane from Fish Consumption by Aquatic Predators Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/ Subcategory)	OES	Organism	SWC (µg/L) [a]	Fish Concentration (mg/kg)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]	RQ
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	American mink (*Mustela vison*)	4,740	21	93	5.1	5.5E−02
		Belted kingfisher (*Ceryle alcyon*)	4,740	21	16	10.9	0.68

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; SWC = surface water concentration; TRI = Toxics Release Inventory
[a] 1,2-dichloroethane concentration represents the highest modeled surface water concentration via VVWM-PSC modeling.
[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (fish), incidental ingestion of sediment, and ingestion of water.

Table 4-13. RQ Based on Potential Trophic Transfer of 1,2-Dichloroethane from Crayfish Consumption by Aquatic Predators Using EPA's Wildlife Risk Model for Eco-SSLs

COU (Life Cycle Stage/Category/ Subcategory)	OES	Organism	BPWC (µg/L) [a]	Crayfish Concentration (mg/kg)	TRV or Hazard Threshold (mg/kg-bw/day)	1,2-Dichloroethane Dietary Exposure (mg/kg/day) [b]	RQ
Disposal/Disposal/Disposal	Waste handling, treatment, and disposal (incinerator)	American mink (*Mustela vison*)	4,090	18	93	4.5	4.8E−02
		Belted kingfisher (*Ceryle alcyon*)	4,090	18	16	9.5	0.59

COU = condition of use; OES = occupational exposure scenario; RQ = risk quotient; TRI = Toxics Release Inventory
[a] 1,2-dichloroethane concentration represents the highest modeled benthic pore water concentration (BPWC) via VVWM-PSC modeling.
[b] Dietary exposure to 1,2-dichloroethane includes consumption of biota (crayfish), incidental ingestion of sediment, and ingestion of water.

4.3.5 Overall Confidence and Remaining Uncertainties in Environmental Risk Characterization

The overall confidence in the risk characterization combines the confidence from the environmental exposure, hazard threshold, and trophic transfer sections. This approach aligns with the 2021 Draft Systematic Review Protocol (U.S. EPA, 2021) and 1,2-Dichloroethane Systematic Review Protocol (U.S. EPA, 2025bd). In the environmental risk characterization, confidence was evaluated from environmental exposures and environmental hazards. Exposure confidence has been synthesized from Section 3.3.4 and is further detailed within Section 4.1.1. Trophic transfer confidence was represented by evidence type as reported in Section 4.1.1 whereas hazard confidence was represented by evidence type as reported in Section 4.2.2. EPA has moderate to robust confidence in the environmental risk assessment.

RQ Inputs for Aquatic, Algal, Benthic, and Semi-Aquatic Mammalian and Avian Assessments

Uncertainties and confidence in modeled exposure estimates from VVWM-PSC have been described in Section 3.3.4. A moderate confidence has been assigned to the exposure component of the RQ input for the aquatic, algal, and benthic assessments as well as the mammalian assessments based on consumption of fish or crayfish by a semi-aquatic terrestrial mammal. Combining the moderate exposure confidence for the PSC-modeled surface water, benthic pore water, and sediment, 1,2-dichloroethane concentrations with the hazard confidences for aquatic, algal, and benthic assessments (robust, moderate, and moderate, respectively) resulted in overall confidences of robust, moderate, and moderate in the RQ inputs for the aquatic (acute and chronic), algal, and benthic (acute and chronic) assessments, respectively.

Combining the moderate exposure confidence for the PSC-modeled surface water and benthic pore water 1,2-dichloroethane concentrations with the moderate hazard confidence for the mammalian and avian assessments and moderate trophic transfer confidence based on the consumption of fish (surface water) or slight trophic transfer confidence based on the consumption of crayfish (benthic pore water) resulted in overall confidences of moderate in the RQ inputs for the mammalian and avian assessments represented by an aquatic-dependent terrestrial mammal and bird.

RQ Inputs for Terrestrial Mammalian, Avian, and Plant Assessments

Uncertainties and confidence in air deposition from AERMOD have been described in Section 3.3.4. Despite the robust confidence in AERMOD air deposition estimates, calculations of soil and soil pore water concentrations from 1,2-dichloroethane daily air deposition rates may add further uncertainty due to assumptions in the equations, therefore resulting in a moderate confidence in the 1,2-dichloroethane soil and soil pore water concentrations from air deposition.

Combining the moderate exposure confidence for the calculated soil and soil pore water concentrations based on AERMOD modeling of 1,2-dichloroethane air deposition from TRI-reported emissions with the respective hazard confidences for terrestrial mammalian, terrestrial avian, and terrestrial plant assessments (moderate, moderate and slight, respectively) and trophic transfer confidence of moderate for the terrestrial mammalian and avian assessments resulted in overall confidences of moderate in the RQ inputs for the terrestrial mammalian, terrestrial avian, and terrestrial plant assessments, respectively.

Byproducts Assessment Confidence

Uncertainties and confidence in the exposure and hazard assessment for the byproducts have been described in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). EPA has moderate confidence that exposure to the byproducts via releases to air, water, and land does not exceed hazard thresholds for aquatic and terrestrial species.

2001 # 5 HUMAN HEALTH RISK ASSESSMENT

1,2-Dichloroethane – Human Health Risk Assessment (Section 5): Key Points

EPA evaluated all reasonably available information to support human health risk characterization of 1,2-dichloroethane for workers, ONUs, consumers, and the general population. Exposures to each group are described in Section 5.1, human health hazards in Section 5.2, and human health risk characterization in Section 5.3. The following bullets summarize the key points:

Exposure Key Points

- EPA assessed inhalation and dermal exposures for workers and ONUs, as appropriate, for each OES (Section 5.1.1). Both dermal and inhalation were primary routes of exposure, depending on the OES.
- The Agency assessed inhalation, dermal, and oral exposures for consumers, as appropriate, for the consumer COU (Section 5.1.2) in scenarios that represent possible high-end exposures. The primary route of exposure was inhalation for most articles, followed by oral and dermal.
- EPA assessed inhalation, oral, and dermal exposures for the general population via ambient air, surface water, drinking water, and fish ingestion (Section 5.1.3).

Hazard Key Points

- EPA identified the following adverse effect as the most sensitive and robust non-cancer hazard associated with oral exposure to 1,2-dichloroethane in experimental animal models (Section 5.2):
  - Renal effects, specifically increased relative kidney weight for the acute, intermediate, and chronic durations of exposure
  - A non-cancer HED was calculated for both the occupational and general population for each exposure scenario and derived via benchmark dose modeling.
  - A total uncertainty factor (UF) of 30 was selected for the acute and intermediate durations of exposure and a UF of 300 was selected for the chronic duration of exposure.
- EPA identified the following adverse effects as the most sensitive and robust non-cancer hazard associated with inhalation exposure to 1,2-dichloroethane in experimental animal models (Section 5.2):
  - Respiratory (olfactory) effects, specifically nasal necrosis for the acute duration of exposure
  - Male reproductive effects, specifically, decreased sperm concentrations for the intermediate and chronic exposure durations
  - A non-cancer HEC was calculated for both the occupational and general population for each exposure scenarios and derived via benchmark dose modeling.
  - A total UF of 30 was selected for the acute and intermediate durations of exposure and a UF of 300 was selected for the chronic duration of exposure.
- EPA derived an inhalation unit risk (IUR) based on combined tumor model and was used to derive a cancer slope factor (CSF) via route-to-route extrapolation to both the oral and dermal routes. Additionally, a drinking water unit risk was also derived from the oral CSF.

Risk Assessment Key Points

- Estimated inhalation and dermal exposures drive risks to workers in occupational settings, particularly during repackaging activities and industrial uses that occur in open systems (Section 5.3.3).
- Estimated inhalation exposure to 1,2-dichloroethane releases to ambient air show risks to the general population residing within 1,000 m of manufacturing facilities.
- No general population estimated risks were below the non-cancer benchmark or above the cancer benchmark for any of the byproducts resulting from 1,2-dichloroethane manufacturing.
- EPA estimates did not indicate MOEs below the non-cancer benchmarks nor above the cancer benchmark for consumer exposures to consumer articles containing 1,2-dichloroethane.
- EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis supporting this draft risk evaluation (Section 5.3.2).

5.1 Summary of Human Exposures

EPA evaluated all reasonably available information for occupational and general population human exposures, including consideration of increased exposure or susceptibility across PESS considerations (see Section 5.3.2).

5.1.1 Occupational Exposures

1,2-Dichloroethane – Occupational Exposures (Section 5.1.1): Key Points

EPA evaluated the reasonably available information for occupational exposures. The following bullets summarize the key points of this section of the risk evaluation:

- EPA identified OESs for each COU of 1,2-dichloroethane and exposure groups for each OES to assess occupational exposure.
- For each OES, central tendency and high-end doses were estimated.
- Estimates based on modeling used probabilistic modeling approaches with Monte Carlo to identify the 50th and 95th percentiles for central tendency and high-end exposures.
- EPA estimated occupational inhalation exposure (in ppm as an 8-hour time-weighted average [TWA]) and dermal exposures (in mg/day) to 1,2-dichloroethane and provided both high-end and central tendency exposures for OESs associated with each COU.
- EPA evaluated the weight of scientific evidence for the exposure assessment of each OES.

Where there was sufficient detail in the monitoring data, EPA assessed exposure to Similar Exposure Groups (SEGs). For example, EPA received inhalation monitoring data for 1,2-dichloroethane manufacturing where SEGs were identified and monitored. If SEGs were not available from the monitoring data or were not able to be assessed from the modeling approach used, EPA followed its standard practice to assess exposure to generic exposure groups (1) "workers" (*i.e.*, workers who work in close proximity to 1,2-dichloroethane, and may handle and have direct contact with 1,2-dichloroethane); and (2) ONUs who do not directly handle 1,2-dichloroethane but may be indirectly exposed to it as part of their employment. EPA identified tasks performed by the workers for each OES.

1,2-Dichloroethane has a vapor pressure of approximately 78.9 mmHg at 25 °C. Based on this high volatility, EPA anticipates that workers and ONUs will be exposed to vapor via the inhalation route. EPA expects worker exposure to liquids via the dermal route but does not expect dermal exposure for ONUs because they do not directly handle 1,2-dichloroethane.

The Occupational Safety and Health Administration (OSHA; accessed July 24, 2025) set a permissible exposure limit (PEL; accessed July 24, 2025) as an 8-hour time-weighted average (TWA) for 1,2-dichloroethane of 50 ppm. California Division of Occupational Safety and Health (Cal/OSHA; accessed July 24, 2025) set an 8-hour TWA for 1,2-dichloroethane of 1 ppm, a short-term exposure limit (STEL) of 2 ppm, and a ceiling limit of 200 ppm). Other governmental agencies and independent groups have also set recommended exposure limits established for 1,2-dichloroethane. The American Conference of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value (TLV) at 10 ppm TWA. This chemical also has a NIOSH Recommended Exposure Limit (REL) of 1 ppm TWA and a 15-minute STEL of 2 ppm (https://www.cdc.gov/niosh/npg/; accessed July 24, 2025).

The following sections briefly describe EPA's approach to assessing occupational exposures and estimating inhalation and dermal exposure for each COU assessed. For additional details on development of approaches and results refer to *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at).

5.1.1.1 Approach and Methodology

The steps that EPA followed in assessing occupational exposure to 1,2-dichloroethane are illustrated below in Figure 5-1.

Figure 5-1. Overview of EPA's Approach to Estimate Occupational Exposure for 1,2-Dichloroethane

EPA follows the hierarchy established in Table 5-1 in selecting data and approaches for assessing occupational exposures (based on (CEB, 1991)).

Table 5-1. Hierarchy of Data and Approaches for Assessing Occupational Exposures to 1,2-Dichloroethane

Type of Approach	Description
1. Monitoring data	a) Personal and directly applicable
	b) Area and directly applicable
	c) Personal and potentially applicable or similar
	d) Area and potentially applicable or similar
2. Modeling approaches	a) Surrogate monitoring data
	b) Fundamental modeling approaches
	c) Statistical regression modeling approaches
3. Occupational exposure limits	a) Company-specific occupational exposure limits (OELs) (for site-specific exposure assessments; for example, there is only one manufacturer who provided their internal OEL to EPA but did not provide monitoring data)
	b) OSHA permissible exposure limit
	c) Voluntary limits: ACGIH Threshold Limit Value (TLV); NIOSH Recommended Exposure Limit (REL); Occupational Alliance for Risk Science (OARS) workplace environmental exposure level (WEELs)

5.1.1.1.1 Identify and Describe Occupational Exposure Scenarios to Assess

As discussed in Section 3.1.1.1, EPA has identified OESs from the COUs to group scenarios with similar sources of exposure at industrial and commercial workplaces within the scope of the risk evaluation. The Agency identified exposure groups for each OES as presented below in Table 5-2. Additional details on worker activities performed by the exposure groups for each OES can be found in *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at).

Table 5-2. Similar Exposure Groups (SEGs) Assessed for 1,2-Dichloroethane

OES	SEGs Assessed by OES
Manufacturing	The final study report published by the Vinyl Institute Consortium (Stantec ChemRisk, 2024) detailed worker activities per SEG that occurred at 1,2-dichloroethane manufacturing sites. The SEGs of operators, logistic technicians, laboratory technicians, maintenance technicians, and ONUs were identified and monitored for inhalation exposure.
Processing as a reactant	The final study report published by the Vinyl Institute Consortium (Stantec ChemRisk, 2024) detailed worker activities per SEG that occurred at 1,2-dichloroethane processing sites. The SEGs of operators, logistic technicians, laboratory technicians, maintenance technicians, and ONUs were identified and monitored for inhalation exposure.
Repackaging	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane when transferring 1,2-dichloroethane from bulk containers into smaller containers. Workers may also be exposed via inhalation of vapor or dermal contact with liquids when cleaning transport containers following emptying. ONUs include supervisors, managers, and other employees that work at sites that process 1,2-dichloroethane into formulations, mixtures, or reaction products but do not directly handle 1,2-dichloroethane are expected to have lower inhalation exposures and no dermal exposure.
Processing into formulation, mixture or reaction product	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane in processing of 1,2-dichloroethane into formulations, mixtures, or reaction products during container unloading, container cleaning, equipment cleaning, and packaging of formulation into containers. They may also be exposed to vapors due to volatilization during the mixing process itself, during product sample collection and analysis, and process maintenance. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial application of adhesives and sealants	EPA assessed the general SEG categories of workers and ONUs. Worker exposures to 1,2-dichloroethane may occur from use of adhesives and sealants during container cleaning and unloading, equipment cleaning, spraying or roll coating, and curing or drying activities. ONUs are potentially exposed via inhalation while present in the application area; however, EPA expects ONUs to have lower inhalation exposures than workers who handle or apply the products, and no expected dermal exposures. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial application of lubricants and greases	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane during application of lubricants and greases during container cleaning and unloading, equipment cleaning, and from inhalation of mist that may occur while spraying or otherwise applying the lubricant or grease. Exposure may also occur during the curing or drying. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial and commercial non-aerosol cleaning and degreasing	EPA assessed the general SEG categories of workers and ONUs. Workers are potentially exposed to 1,2-dichloroethane during industrial and commercial non-aerosol cleaning and degreasing (particularly vapor degreasing) while unloading the chemical from transport containers, during degreaser operation, and during cleaning and maintenance activities. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Industrial and commercial aerosol products	EPA assessed the general SEG categories of workers and ONUs. A brake servicing scenario was modeled with the workers performing the tasks associated with brake servicing. ONUs are expected to have lower inhalation exposures and no dermal exposure.

OES	SEGs Assessed by OES
Laboratory use	EPA assessed the SEG of laboratory technician and the general category of ONU. Occupational inhalation data for 1,2-dichloroethane were provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. This dataset included monitoring of the similar exposure group of laboratory technicians which was also used for this OES. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Waste handling, treatment, and disposal – landfills	EPA assessed the SEG of laboratory technician and the general category of ONU. Workers are potentially exposed to 1,2-dichloroethane via inhalation of vapors or dermal contact with liquids during the unloading and cleaning of transport containers. ONUs are expected to have lower inhalation exposures and no dermal exposure.
Waste handling, treatment, and disposal – wastewater treatment	EPA assessed the SEG of laboratory technician and the general category of ONU. Workers are potentially exposed to 1,2-dichloroethane via inhalation of vapors or dermal contact with liquids during the unloading and cleaning of transport containers. ONUs are expected to have lower inhalation exposures and no dermal exposure.

5.1.1.1.2 Approaches Used to Estimate Inhalation Exposure for 1,2-Dichloroethane

EPA followed the exposure assessment hierarchy depicted in Table 5-1 and used the highest rated approach available for each OES. A summary of the approaches used to estimate inhalation exposure for each OES for 1,2-dichloroethane is presented below in Table 5-3. Additional details on worker activities performed by the exposure groups for each OES can be found in *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at).

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OES	Approach Used to Estimate Inhalation Exposure
Manufacturing	***1,2-Dichloroethane personal breathing zone (PBZ) monitoring data from test order:*** Inhalation exposures were assessed based on inhalation monitoring data provided to EPA via a test order submission from the Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane (Stantec ChemRisk, 2024). The monitoring was conducted according to an EPA-approved study plan and exposures were monitored for 5 SEGs including ONUs. The test order includes 123 worker and 39 ONU full-shift (8–12 hour) PBZ samples across 5 manufacturing facilities from this dataset to estimate inhalation exposures.
Processing as a reactant	***1,2-Dichloroethane PBZ monitoring data from test order:*** Occupational inhalation data for 1,2-dichloroethane during processing as a reactant were provided via a test order submission from the Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane (Stantec ChemRisk, 2024). The monitoring was conducted according to an EPA-approved study planand exposures were monitored for 5 SEGs including ONUs. The Agency identified 48 worker and 14 ONU full-shift PBZ samples from 2processing facilities from this dataset to estimate inhalation exposures. ***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA also reviewed inhalation data provided via a test order submission as a comparison, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 112 worker personal sample data points and 16 ONU personal sample data points.
Repackaging	***1,2-Dichloroethane PBZ monitoring data obtained from literature search:*** EPA conducted a systematic review and identified one source containing monitoring data for 1,2-dichloroethane for the Repackaging OES. The study contained 2 full-shift PBZ values for workers engaged in drum filling (NIOSH, 1976). ***Exposure modeling:*** Given the limited monitoring data available, EPA modeled exposure based on exposure estimation approaches for worker activities using the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a). EPA used vapor generation rate and exposure duration parameters from the 1991 CEB Manual (CEB, 1991) and the EPA Mass Balance Inhalation Model to model the exposure and the modeling included Monte Carlo simulation to generate estimates at various percentiles including the 50th percentile for central tendency and 95th percentile for high-end. ***ONUs:*** EPA used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.
Processing into formulation, mixture or reaction product	***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA used inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 112 worker personal sample data points and 16 ONU personal sample data points. ***ONUs:*** The study noted above included 16 ONU personal sample data points. These data were the same order of magnitudes as the central tendency worker exposure sampling data.
Industrial application of adhesives and sealants	***PBZ monitoring data for trichloroethylene (TCE) from published risk evaluation used as a surrogate to estimate exposure to 1,2-dichloroethane:*** EPA used surrogate data from trichloroethylene (TCE) during use of paints, coatings, adhesives, and sealants. TCE has a similar vapor pressure of 73.5 mm Hg, vs. 78.9 mm Hg for 1,2-dichloroethane. The data includes 22 samples for workers. ***ONUs:*** The data includes 2 samples for ONUs.

OES	Approach Used to Estimate Inhalation Exposure
Industrial application of lubricants and greases	***Exposure modeling:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in lubricant and grease applications. Therefore, EPA estimated inhalation exposures using EPA's Brake Servicing Near-Field/Far-Field Exposure Model with Monte Carlo simulation. The Agency used the brake servicing model as an analogous scenario for this OES due to aerosol use. The model determines the application rate of 1,2-dichloroethane based on its weight fraction in the aerosol product. EPA uses a uniform distribution for these weight fractions, ranging from 5–10%. The exposure concentration in the near-field is used to estimate exposure to the "worker" ***ONUs:*** The exposure concentration in the far-field is used to estimate exposure to the ONU.
Industrial and commercial non-aerosol cleaning and degreasing	***PBZ monitoring data for trichloroethylene (TCE) from published risk evaluation used as a surrogate to estimate exposure to 1,2-dichloroethane:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in non-aerosol degreasers. The Agency used surrogate data from TCE during Batch Open-Top Vapor Degreasing. Batch open-top vapor degreasing was the non-aerosol cleaning and degreasing method chosen for this assessment because it has the highest exposure potential of the possible cleaning and degreasing methods 1,2-dichloroethane may be used for. The TCE data set included 113 samples for workers. Applying data from a batch open top vapor degreasing process in assessment of this OES for 1,2-dichloroethane is a conservative estimate of exposure. ***ONUs:*** The TCE data set included 10 samples for ONUs.
Industrial and commercial aerosol products	***Exposure modeling:*** EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in lubricant and grease applications. Therefore, the Agency estimated inhalation exposures using EPA's Brake Servicing Near-Field/Far-Field Exposure Model with Monte Carlo simulation. The Agency used the brake servicing model as an analogous scenario for this OES due to aerosol use. The model determines the application rate of 1,2-dichloroethane based on its weight fraction in the aerosol product. EPA uses a uniform distribution for these weight fractions, ranging from 90–100%. The exposure concentration in the near-field is used to estimate exposure to the "worker" ***ONUs:*** The exposure concentration in the far-field is used to estimate exposure to the ONU.
Laboratory use	***1,2-Dichloroethane PBZ monitoring data from test order used as analogous data for this OES:*** Occupational inhalation data for 1,2-dichloroethane were provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. Within this dataset for manufacturers, EPA identified 29 worker full-shift PBZ samples for laboratory technicians. The Agency assumes the tasks described for laboratory technicians in a manufacturing setting would be similar to tasks performed by laboratory technicians in a commercial laboratory setting and uses the data as analogous data to assess inhalation exposure for workers for the laboratory use OES. ***1,2-Dichloroethane PBZ monitoring data obtained from test order submission:*** EPA also reviewed additional inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide (BASF, 2021). This study contained 6 worker personal sample data points. ***ONUs:*** EPA did not identify data applicable to estimation of ONU exposure at commercial laboratories. The Agency used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.
Waste handling, treatment, and disposal – landfills	***Area monitoring data for 1,2-dichloroethane:*** EPA did not identify any PBZ monitoring data but did identify area data from a landfill study in Greece, which included 12 samples (Loizidou and Kapetanios, 1992). The landfill receives both municipal and industrial waste.

OES	Approach Used to Estimate Inhalation Exposure
	ONUs: EPA did not identify data applicable to estimation of ONU exposure at landfills. The Agency used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.
Waste handling, treatment, and disposal – wastewater treatment	***1,2-Dichloroethane PBZ monitoring data obtained from literature search:*** For WWT facilities, EPA identified a study at an activated sludge biological treatment plant in Finland, which included summaries statistics based on 18 PBZ samples (Lehtinen and Veijanen, 2011). ***ONUs:*** EPA did not identify data applicable to estimation of ONU exposure at landfills. The Agency used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures.

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5.1.1.2 Summary of the Inhalation and Dermal Exposure Assessment

Table 5-4 presents a summary of inhalation exposure results based on reasonably available monitoring data and exposure modeling for each OES. This tables provides a summary of the 8-hour time weighted average (8-hour TWA) inhalation exposure estimates, as well as the acute dose (AD), the intermediate average daily dose (IADD), and the chronic average daily dose (ADD). Table 5-4 also presents a summary of dermal exposure results; a summary of the acute potential dose rate (APDR) for occupational dermal exposure estimates, as well as the AD, the IADD, and the chronic ADD. The *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at) provides additional details regarding AD, IADD, and ADD calculations along with EPA's approach and methodology for estimating inhalation and dermal exposures.

Table 5-4. Summary of Occupational Inhalation and Dermal Exposure Results by Occupational Exposure Scenarios

OES	Worker Description	Exposure Days (day/yr)	Worker Inhalation Estimates (ppm)		ONU Inhalation Estimates (ppm) [a]		Worker Dermal Exposure Estimates (mg/day)		Sources/Notes for Inhalation Data
			Central Tendency	High-End	Central Tendency	High-End	Central Tendency	High-End	
Manufacturing	Operators	250	0.48	7.3	1.4E−02	1.6	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	1.7E−02	0.24					
	Maintenance technicians	250	4.9E−02	1.60					
	Laboratory technicians	250	4.7E−02	1.30					
Manufacturing of 1,2-dichloroethane as an unintended byproduct	Operators	250	7.4E−02	0.27	4.9E−03	0.16	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	6.5E−02	1.70					
	Maintenance technicians	250	2.1E−02	0.36					
	Laboratory technicians	250	2.6E−02	7.6E−02					
Repackaging	–	250	35	45	35		3.2	3.2	NIOSH (1976)
Repackaging (modeled)	–	24–119	4.9	18	4.9		3.2	3.2	U.S. EPA (2022a)
Processing as a reactant	Operators	250	1.3E−03	4.8E−03	2.1E−04	2.6E−04	3.2	5.5	Stantec ChemRisk (2024)
	Logistics technicians	250	0.17	2.3					
	Maintenance technicians	250	3.2E−03	2.1E−03					
	Laboratory technicians	250	6.9E−04	1.5E−03					
	Herbicide manufacture	250	0.19	1.4	0.19	0.23			BASF (2021)
Processing into formulation, mixture, or reaction product	Herbicide manufacture	250	0.19	1.4	0.19	0.23	3.2	5.5	BASF (2021)
Industrial application of adhesives and sealants	–	250	4.6	40	0.90	1.0	3.0	5.1	Surrogate data – TCE
Industrial application of lubricants and greases	–	250	3.5	9.0	2.3	7.4	0.24	0.45	Aerosol degreasing model
Industrial and commercial non-aerosol cleaning/degreasing	–	250	14	78	1.1	9.1	3.2	5.5	Surrogate data – TCE
Commercial aerosol products (aerosol degreasing, aerosol lubricants)	–	250	46	112	30	93	3.1	5.3	Aerosol degreasing model

<table>
<tr><th rowspan="2">OES</th><th rowspan="2">Worker Description</th><th rowspan="2">Exposure Days (day/yr)</th><th colspan="2">Worker Inhalation Estimates (ppm)</th><th colspan="2">ONU Inhalation Estimates (ppm) [a]</th><th colspan="2">Worker Dermal Exposure Estimates (mg/day)</th><th rowspan="2">Sources/Notes for Inhalation Data</th></tr>
<tr><th>Central Tendency</th><th>High-End</th><th>Central Tendency</th><th>High-End</th><th>Central Tendency</th><th>High-End</th></tr>
<tr><td>Commercial use as a laboratory chemical</td><td>Laboratory technicians</td><td>250</td><td>4.7E−02</td><td>1.3</td><td rowspan="2" colspan="2">4.7E−02</td><td rowspan="2">2.2</td><td rowspan="2">2.2</td><td>Stantec ChemRisk (2024)</td></tr>
<tr><td>Commercial use as a laboratory chemical</td><td>Herbicide manufacture</td><td>250</td><td>0.11</td><td>0.12</td><td>BASF (2021)</td></tr>
<tr><td>Distribution in commerce</td><td colspan="8">Not estimated</td><td>N/A</td></tr>
<tr><td>Waste handling, treatment, and disposal (landfill)</td><td>–</td><td>250</td><td>7.8E−04</td><td>7.8E−04</td><td>8.9E−02</td><td>0.24</td><td>1.6</td><td>4.0</td><td>Loizidou and Kapetanios (1992)</td></tr>
<tr><td>Waste handling, treatment, and disposal (POTW, non-POTW WWT)</td><td>–</td><td>250</td><td>8.9E−02</td><td>0.24</td><td colspan="2">8.9E−02</td><td>1.6</td><td>4.0</td><td>Lehtinen and Veijanen (2011)</td></tr>
<tr><td>Waste handling, treatment, and disposal (remediation)</td><td colspan="9">Not estimated</td></tr>
<tr><td colspan="10">NIOSH = National Institute for Occupational Safety and Health; OES = occupational exposure scenario(; ONU = occupational non-user; POTW = publicly owned treatment works; WWT = wastewater treatment
[a] Where EPA was not able to estimate ONU inhalation exposure from monitoring data or models, this was assumed equivalent to the central tendency experienced by workers for the corresponding OES; dermal exposure for ONUs was not evaluated because they are not expected to be in direct contact with 1,2-dichloroethane.</td></tr>
</table>

5.1.1.3 Summary of Inhalation and Dermal Exposure Assessment to Byproducts

EPA's approach to assessing the occupational exposures to the byproducts produced during the manufacture of 1,2-dichloroethane is described in detail in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). The Agency assessed exposures to workers via inhalation and dermal routes. For estimates based on inhalation monitoring data, the 50th percentile of the exposure data is used for the central tendency and the 95th percentile is used for the high-end estimate. For deterministic modeling, EPA selects values for the model input parameters for the central tendency and high-end exposure estimates. For probabilistic modeling, the Agency used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations used the range of input parameters to generate the distribution of potential exposures. The full inputs and results are presented in the *Draft Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025o).

Acute, intermediate, and chronic inhalation exposures were estimated using PBZ inhalation monitoring data obtained through test orders.[10] For 1,1-dichloroethane, EPA used inhalation monitoring data submitted in response to a test order that measured 1,1-dichloroethane inhalation exposures during 1,2-dichloroethane manufacturing (Stantec ChemRisk, 2023). For the remaining assessed byproducts (trichloroethylene, perchloroethylene, methylene chloride, and carbon tetrachloride), the Agency used surrogate inhalation monitoring data submitted in response to the 1,2-dichloroethane test order, following the same methodology outlined in the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj). Table 5-5 presents the results of the inhalation exposure assessment for each byproduct. For more information on inhalation exposure estimates see. For additional information on inhalation exposure estimates, see *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l) and *Draft Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025o).

Dermal exposures were modeled using the Dermal Exposure to Volatile Liquids Model, consistent with the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj), based on values and assumptions from dermal test order data obtained for 1,2-dichloroethane (Labcorp Early Development, 2024) and from previously published chemical-specific risk evaluations (listed in Section 1.2 of the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l)). EPA assessed dermal occupational exposures to both unpurified 1,2-dichloroethane (considered a low-end exposure estimates), and light- and heavy-end liquid streams (considered a high-end exposure estimates). Low-end concentrations were estimated for each of the byproduct based on the weight percent of the byproduct in the unpurified 1,2-dichloroethane stream. High-end concentrations were estimated for each of the byproducts based on the maximum weight percent of the byproduct in light- and heavy-end liquid streams. These concentration estimates were provided by Vinyl Institute and are presented in Table 5-9 of the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). Table 5-6 summarizes the APDR, acute retained dose (ARD), intermediate retained dose (IRD), chronic retained dose (CRD) for non-cancer, and CRD for cancer for each of the byproducts. The high-ends are based on a higher loading rate of byproduct (2.1 mg/cm^2 per event) and a skin surface area equivalent to the area of two-hands (1,070 cm^2) that may occur during activities such as manual cleaning of the equipment. The central tendencies are based on a lower loading rate of 1,2-dichloroethane (1.4 mg/cm^2 per event) and a skin surface area equivalent to the area of one-

[10] TSCA section 4(a)(2)(A)(i) allows the EPA to impose testing requirements via "rule, order, or consent agreement" whenever new information "is necessary" in order to perform a risk evaluation (15 U.S.C. § 2603(a)(2)(A)(i)). EPA issued a test order for 1,2-dichloroethane on January 14, 2021; see https://www.epa.gov/sites/default/files/2021-01/documents/tsca_section_4a2_order_for_12-dichloroethane_on_ecotoxicity_and_occupational_exposure_0.pdf (accessed November 12, 2025) (Stantec ChemRisk, 2024). EPA also received inhalation monitoring data from the test order submission for 1,1-dichloroethane manufactured as a byproduct in the manufacture of 1,2-dichloroethane (Stantec ChemRisk, 2023).

hand (535 cm^2) that may occur while sampling the liquid stream. See *Draft Byproducts Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025o) for the calculations that lead to these results.

Table 5-5. Summary of Occupational Inhalation Exposure Results to Byproducts During the Manufacturing of 1,2-Dichloroethane

Byproduct	Process Stream (wt % Fraction of Byproducts in the Process Stream)	Similar Exposure Group	8-Hour TWA Exposure Concentrations		Acute Exposure Concentrations (AC)		Intermediate Average Daily Concentration ($ADC_{intermediate}$)		Average Daily Concentration (ADC)		Lifetime Average Daily Concentration (LADC)	
			Central Tendency (ppm) [a]	High-End (ppm) [b]	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)
1,1-Dichloroethane	N/A [c]	Operator/Process Technician	1.6E−03	9.0E−03	1.1E−03	6.1E−03	7.8E−04	4.5E−03	7.3E−04	4.2E−03	2.9E−04	2.2E−03
		Maintenance Technician	2.3E−04	2.7E−03	1.6E−04	1.8E−03	1.1E−04	1.3E−03	1.1E−04	1.3E−03	4.3E−05	6.5E−04
		Logistics/ Distribution	6.7E−05	1.6E−03	4.6E−05	1.1E−03	3.3E−05	8.0E−04	3.1E−05	7.5E−04	1.2E−05	3.8E−04
		Laboratory Technician	1.6E−04	3.3E−03	1.1E−04	2.2E−03	8.0E−05	1.6E−03	7.5E−05	1.5E−03	3.0E−05	7.9E−05
		Occupational Non-User	6.9E−05	4.6E−03	4.7E−05	3.1E−03	3.5E−05	2.3E−03	3.2E−05	2.1E−03	1.3E−05	1.1E−03
Trichloroethylene [d]	Unpurified 1,2-Dichloroethane (0.0035%) to Light- / Heavy-Ends (0.23%) [e]	Operator / Process Technician	1.9E−03	8.3E−03	1.3E−03	5.6E−03	9.7E−04	4.1E−03	9.0E−04	3.9E−03	1.8E−04	9.7E−04
		Maintenance Technician	5.4E−04	2.4E−03	3.6E−04	1.6E−03	2.7E−04	1.2E−03	2.5E−04	1.1E−03	4.9E−05	2.8E−04
		Logistics/ Distribution	6.0E−05	2.5E−04	4.1E−05	1.7E−04	3.0E−05	1.3E−04	2.8E−05	1.2E−04	5.4E−06	2.9E−05
		Laboratory Technician	5.2E−04	2.3E−03	3.5E−04	1.6E−03	2.6E−04	1.2E−03	2.4E−04	1.1E−03	4.7E−05	2.7E−04
		Occupational Non-User	3.6E−04	1.6E−03	2.4E−04	1.1E−03	1.8E−04	8.1E−04	1.7E−04	7.6E−04	3.2E−05	1.9E−04
Perchloroethylene	Unpurified 1,2-dichloroethane (0.01%)	Worker	1.0E−05	1.5E−04	6.9E−06	1.1E−04	5.1E−06	7.7E−05	4.7E−06	7.2E−05	1.9E−06	3.7E−05
		Occupational Non-User	3.0E−07	3.4E−05	2.0E−07	2.3E−05	1.5E−07	1.7E−05	1.4E−07	1.6E−05	5.5E−08	8.1E−06
	Light- / heavy-ends (0.8%) [e]	Worker	9.5E−03	1.4E−02	6.5E−04	9.8E−03	4.7E−04	7.2E−03	4.4E−04	6.7E−03	1.8E−04	3.5E−03
		Occupational Non-User	2.8E−05	3.2E−03	1.9E−05	2.2E−03	1.4E−05	1.6E−03	1.3E−05	1.5E−03	5.1E−06	7.6E−04

Byproduct	Process Stream (wt % Fraction of Byproducts in the Process Stream)	Similar Exposure Group	8-Hour TWA Exposure Concentrations		Acute Exposure Concentrations (AC)		Intermediate Average Daily Concentration (ADC$_{intermediate}$)		Average Daily Concentration (ADC)		Lifetime Average Daily Concentration (LADC)	
			Central Tendency (ppm) [a]	High-End (ppm) [b]	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)
Methylene chloride	Unpurified 1,2-dichloroethane (0.12%)	Worker	3.1E−03	4.7E−02	2.1E−03	3.2E−02	1.6E−03	2.4E−02	1.5E−03	2.2E−02	5.8E−04	1.1E−02
		Occupational Non-User	9.1E−05	1.0E−03	6.2E−05	7.1E−03	4.5E−05	5.2E−03	4.2E−05	4.8E−03	1.7E−05	2.5E−03
	Light- / heavy-ends (0.1%) [e]	Worker	7.7E−03	0.12	5.3E−03	8.0E−02	3.9E−03	5.9E−02	3.6E−03	5.5E−02	1.4E−03	2.8E−02
		Occupational Non-User	2.3E−04	2.6E−02	1.5E−04	1.8E−02	1.1E−04	1.3E−02	1.1E−04	1.2E−02	4.2E−05	6.2E−03
Carbon tetrachloride	Unpurified 1,2-dichloroethane (0.10%) to Light- / heavy-ends (21.6%) [e]	Operator / Process Technician	0.33	1.4	0.23	0.98	0.17	0.72	0.15	0.67	0.06	0.34
		Maintenance Technician	0.09	0.42	0.06	0.28	4.5E−02	0.21	0.04	0.19	0.02	0.10
		Logistics/ Distribution	0.01	0.04	7.0E−03	0.03	5.1E−03	2.2E−02	4.8E−03	0.02	1.9E−03	0.01
		Laboratory Technician	0.09	0.40	0.06	0.27	4.4E−02	0.20	0.04	0.19	0.02	0.10
		Occupational Non-User	0.06	0.28	0.04	0.19	3.1E−02	0.14	0.03	0.13	0.01	0.07

[a] For 1,1-dichloroethane, the central tendency is the 50th percentile (median) of occupational exposures among all workers within a given SEG, based on Vinyl Institute inhalation test order monitoring data (Stantec ChemRisk, 2023). For all other byproducts, the central tendency estimate is based on the 50th percentile exposure for 1,2-dichloroethane from the Vinyl Institute inhalation test order monitoring data set (Stantec ChemRisk, 2024) adjusted for vapor pressure and model fraction for the byproduct chemical using Equation 4-1 in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

[b] For 1,1-dichloroethane, the high-end is the 95th percentile of occupational exposures among all workers within a given SEG, based on Vinyl Institute inhalation test order monitoring data (Stantec ChemRisk, 2023). For all other byproducts, the high-end estimate is based on the 95th percentile exposure for 1,2-dichloroethane from the Vinyl Institute inhalation test order monitoring data set (Stantec ChemRisk, 2024) adjusted for vapor pressure and mole fraction for the byproduct chemical using Equation 4-1 in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

[c] The unpurified 1,2-dichloroethane and light- / heavy-ends exposure concentrations were not used for 1,1-dichloroethane because inhalation exposure estimates are based on 1,1-dichloroethane test order monitoring data collected at 1,2-dichloroethane manufacturing facilities (Stantec ChemRisk, 2023).

[d] High-end, screening level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined the analysis by performing Monte Carlo analysis to vary the concentration from the low end to high end exposures (equal distribution) as well as separating the exposures by SEG.

[e] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process, known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.

Table 5-6. Summary of Dermal Exposure Doses to Byproducts for an Average Adult Worker During the Manufacturing of 1,2-Dichloroethane[a]

Byproduct	Process Stream (% Fraction of Byproducts in the Process Stream)	Acute Potential Dose Rate (APDR) (mg/day)		Acute Retained Dose (ARD) (mg/kg-day)		Intermediate Retained Dose (IRD), Non-Cancer		Chronic Retained Dose (CRD), Non-Cancer (mg/kg-day)		Chronic Retained Dose (CRD), Cancer (mg/kg-day)	
		Central Tendency (ppm) [b]	High-End (ppm) [c]	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)	Central Tendency (ppm)	High-End (ppm)
1,1-Dichloroethane	Unpurified 1,2-dichloroethane (0.29%)	6.5E−03	2.0E−02	8.2E−05	2.5E−04	6.0E−05	1.8E−04	5.6E−05	1.7E−04	2.2E−05	8.6E−05
	Light / heavy-ends [d] (30%)	0.67	2.0	8.4E−03	2.5E−02	6.2E−03	1.9E−02	5.8E−03	1.7E−02	2.3E−03	8.9E−03
Trichloroethylene [e]	Unpurified 1,2-dichloroethane (0.0035%) to light- / heavy-ends [d] (0.23%)	0.09	0.24	1.2E−03	3.1E−03	8.5E−04	2.2E−03	7.9E−04	2.1E−03	2.9E−04	8.6E−04
Perchloroethylene	Unpurified 1,2-dichloroethane (0.015%)	1.5E−02	4.4E−02	1.8E−04	5.5E−04	1.3E−04	4.0E−04	1.3E−04	3.8E−04	5.0E−05	1.9E−04
	Light- / heavy-ends [d] (1.1%)	1.1	3.2	1.3E−02	4.0E−02	9.8E−03	2.9E−02	9.2E−02	2.8E−02	3.6E−03	1.40E−02
Methylene chloride	Unpurified 1,2-dichloroethane; light- / heavy-ends (0.0999%) [f]	6.0E−02	0.18	7.5E−04	2.2E−03	5.5E−04	1.6E−03	5.1E−04	1.5E−03	2.0E−04	7.9E−04
Carbon tetrachloride [e]	Unpurified 1,2-dichloroethane (0.15%) to light- / heavy-ends (30%) [d]	6.0	16	0.07	0.20	0.05	0.15	0.05	0.14	0.02	0.06

[a] Conditions where no gloves are used, or for any glove/gauntlet use without permeation data and without employee training. This is a standard scenario that EPA uses. It should be noted that the test order summary reports include data on glove use at the monitored facilities.
[b] Central tendency is based on a lower loading rate of 1,2-dichloroethane (1.4 mg per cm^2 per event) and one-hand contact.
[c] High-end is based on a higher loading rate of byproduct (2.1 mg per cm^2 per event) and two-hand contact.
[d] Light-ends liquid streams are the more volatile fractions in the mixture, typically derived from the initial stages of refining process, known for their lower boiling points. Heavy-ends liquid streams are the less volatile, higher boiling point fractions obtained towards the later stages of the refining process.
[e] High-end screening-level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined the analysis by performing Monte Carlo analysis to vary the concentration from the low-end to high-end exposures (equal distribution).
[f] Note that methylene chloride had the same concentration in the unpurified 1,2-dichloroethane stream and then light- / heavy-ends, and thus only has 1 row of results.

5.1.1.4 Estimate the Number of Workers and Occupational Non-Users Potentially Exposed

An assessment objective is to estimate the number of workers and ONUs potentially exposed. Normally, a primary difference between workers and ONUs is that workers may handle 1,2-dichloroethane and have direct contact with the chemical, while ONUs are working in the general vicinity of workers but do not handle 1,2-dichloroethane nor have direct contact with 1,2-dichloroethane being handled by the workers. The size of the area that ONUs may work can vary across each OES and across facilities within the same OES and will depend on the facility configuration, building and room sizes, presence of vapor barrier, and worker activity pattern.

Methodology

Where available, EPA used CDR data to provide a basis to estimate the number of workers and ONUs. Data were available from the 2016 and 2020 CDR for manufacturing sites; however, the Agency determined this was not sufficient to determine the total number of workers for that OES. EPA supplemented the available CDR data using available market data; NAICS and Standard Industrial Classification (SIC) code data from TRI, DMR, and NEI sites identified for each COU; and analyzed U.S. Bureau of Labor Statistics (BLS) and U.S. Census data using the methodology described in the Environmental Releases and Occupational Exposure Assessment TSD. Where market penetration data and site-specific NAICS/SIC codes from TRI/DMR/NEI were not available, EPA estimated the number of workers using data from GSs and ESDs. For additional details on development of estimates of number of workers refer to *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at). EPA also determined the number of days per year that workers are potentially exposed to 1,2-dichloroethane. In general, the exposure frequency is the same as the number of operating days per year for a given OES. However, if the number of operating days exceeded 250 days per year, EPA assumed that a single worker would not work more than 250 days per year such that the maximum exposure days per year was still 250.

Results

Table 5-7 provides a summary for the number of workers and ONUs potentially exposed to 1,2-dichloroethane per facility. The estimates are provided for a facility within each OES.

Table 5-7. Total Number of Workers and ONUs Potentially Exposed to 1,2-Dichloroethane for Each OES

OES	Exposure Days Per Year	Potential Number of Sites	Potential Number of Workers per Site[a]	Potential Number of ONUs per Site[a]
Manufacturing	250	45	33	16
Processing as a reactant	250	90	27	15
Processing into formulation, mixture, or reaction product	250	24	22	12
Processing – repackaging	250	59	1	1
Processing – repackaging (modeled)	24–119[b]	59	1	1
Industrial application of adhesives and sealants	250	83	43	19
Industrial application of lubricants and greases	250	4	75	22

OES	Exposure Days Per Year	Potential Number of Sites	Potential Number of Workers per Site[a]	Potential Number of ONUs per Site[a]
Industrial non-aerosol cleaning/degreasing	250	4	76	22
Commercial aerosol products	250	30	12	5
Commercial use as a laboratory chemical	250	14	6	10
Waste handling, treatment, and disposal	250	39	14	12
Waste handling, treatment, and disposal (POTW)	250	146	1	1
Waste handling, treatment, and disposal (remediation)	Not assessed			

[a] Number of workers and ONUs estimates based on U.S. Census Bureau Data, U.S. BLS data, CDR, DMR, TRI, and NEI (BLS, 2023; U.S. Census Bureau, 2017).
[b] Exposure days per year is based on the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a).
The following OESs were qualitatively assessed: Industrial heat transferring agent; Commercial plastic and rubber products; and Commercial fuels and related products.

5.1.1.5 Weight of Scientific Evidence Conclusions for Occupational Exposure

EPA estimated occupational exposure using several sources of air monitoring data; however, the source used the most in this assessment was an inhalation exposure monitoring study submitted to the Agency by Vinyl Institute in response to a test order (Stantec ChemRisk, 2024). These data were determined to have overall data quality ratings of high through EPA's systematic review process. Other studies used had data quality ratings of high or medium.

In Table 5-8, EPA summarizes the weight of scientific evidence ratings for the occupational exposures for each OES. The Agency has the highest confidence (robust) in Manufacturing and processing as a reactant (where PBZ monitoring data was used to estimate exposures). Other OESs have ratings of moderate as they primarily used surrogate data or modeling. For more detail, see the *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at).

2169 **Table 5-8. Summary of Assumptions, Uncertainty, and Overall Confidence in Occupational Inhalation Exposure Estimates by OES**

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Manufacturing	Robust	For this OES, EPA had inhalation monitoring data from manufacturing and processing facilities of 1,2-dichloroethane provided via a test order submission from Vinyl Institute. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates for the Manufacturing OES. The primary strengths of the inhalation occupational exposure estimates for this OES include the use of personal breathing zone samples directly applicable to this OES, which are preferrable to other assessment approaches such as modeling or the use of OELs, and the high number of samples available for workers and ONUs. EPA used full-shift PBZ air concentration data to assess inhalation exposures, with the data source having a high data quality rating from the systematic review process. Another strength is that the data used from Vinyl Institute were 1,2-dichloroethane-specific from multiple facilities that manufacture and process 1,2-dichloroethane; the data included 123 worker and 39 ONU full-shift (8–12 hour) PBZ samples across 5 manufacturing facilities for intentional production of 1,2-dichloroethane, and 53 worker and 6 ONU full-shift PBZ samples from 2 facilities for the unintentional production of 1,2-dichloroethane as a byproduct. EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule. There were data in the test order summary report that indicated that certain tasks are done on a daily basis, while others are done less frequently. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a robust estimate of exposures.
Repackaging	Slight to Moderate	For this OES, EPA had limited inhalation monitoring data, consisting only of 2 full-shift PBZ values for workers from a monitoring study with a low data quality rating from the systematic review process due to the study's age (20+ years), and lack of description of sampling or analytical methodology. Because EPA does not expect this inhalation monitoring data to sufficiently represent all potential exposures during repackaging, the Agency supplemented the assessment by modeling inhalation exposures. EPA used assumptions and values from the July 2022 Chemical Repackaging GS (U.S. EPA, 2022a), having a high data quality rating from the systematic review process, to assess inhalation exposures (OECD, 2009b). EPA also used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. A strength of the Monte Carlo modeling approach is that setting the range of model input values and conducting probabilistic modeling provides a full distribution of potential exposure values that are more likely than a discrete value to capture actual exposure at sites. The primary limitation is the uncertainty in the representativeness of values toward the true distribution of potential inhalation exposures. Also, EPA assumed that one import container is unloaded/day for repackaging,

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Repackaging *(continued)*	Slight to Moderate *(continued)*	so the number of containers unloaded/year is equal to the number of exposure days/year. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for the repackaging assessment based on the inhalation monitoring data is slight to moderate. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for repackaging and used a default assumption of the central tendency from modeled workers inhalation exposures to represent ONU inhalation exposures. EPA has lower confidence in the ONU estimate but still within the slight to moderate range.
Processing as reactant	Robust	For this OES, EPA had inhalation data provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The Agency used 1,2-dichloroethane test order inhalation data to assess inhalation exposures. The primary strength of these data is the use of personal and directly applicable data, and the number of samples available for workers and ONUs. EPA identified 48 worker and 14 ONU full-shift PBZ samples from 2 processing facilities from this dataset to estimate inhalation exposures. EPA identified 4 additional worker full-shift PBZ samples to be included in this OES from data where the unintentional production of 1,2-dichloroethane as a byproduct occurs, after metadata suggested processing as a reactant was occurring and a review of TRI reporting confirmed. These additional data points need to be integrated into this OES. EPA also reviewed inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 112 worker personal sample data points and 16 ONU personal sample data points. The range of data in this source was within the range of data from the 1,2-dichloroethane test data. The primary limitation is that EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a robust estimate of exposures.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Processing into formulation, mixture, or reaction product	Moderate	EPA used inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This study contained 112 worker personal sample data points and 16 ONU personal sample data points. The ONU data confirm EPA's assumptions that ONU exposure is the central tendency of worker exposure by being the same order of magnitude. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The primary strength of the test order submission is the use of personal and directly applicable data. The primary limitation of the data is that it is a single site and may not be representative of all processing sites. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures.
Application of adhesives and sealants	Moderate	For this OES, EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in the application of adhesives and sealants. Based on available data, the Agency used surrogate data from TCE during Use of paints, coatings, adhesives, and sealants. The dataset, obtained from NIOSH Health Hazard Evaluation report (HHEs) as well as 3 OSHA facility inspections, contained 22 samples for workers and 2 samples for ONUs, and encompassed facilities using TCE in adhesive and coating applications. It had a medium data quality rating from the systematic review process. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The strength of these data includes that they are personal breathing zone and are expected to be applicable to 1,2-dichloroethane similar activities. TCE and 1,2-dichloroethane also have similar vapor pressures (73.5 mm Hg vs. 78.9 mmHg for 1,2-dichloroethane), adding to the confidence that TCE is an appropriate surrogate for 1,2-dichloroethane. The primary limitation of this assessment is that it is based on data from a different chemical, which will cause inherent uncertainties due to differences in the chemical properties. Additionally, EPA assumed 250 exposure days/year based on exposure each working day for a typical worker schedule, and it is uncertain whether this estimate is representative of actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures.

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Application of lubricants and greases	Slight to Moderate	For this OES, EPA did not identify relevant inhalation monitoring data and used modeling to estimate occupational exposures. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations was used to generate the full distribution of potential exposures based on the range for each input parameter. Various model parameters were derived from a CARB brake service study, having a high data quality rating from the systematic review process, and 1,2-dichloroethane concentration data from SDSs of various products. EPA considered the assessment approach, the quality of the data used in the model, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation air concentrations. A strength of the Monte Carlo modeling approach is that representing the range in model input values and the resulting distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. Other strengths of this model include the use of parameters derived from applicable exposure scenarios such as the CARB brake service study, and the use of known 1,2-dichloroethane concentration data from products currently on the market. The primary limitations include the uncertainty of the representativeness of modeled air concentrations toward the true distribution of inhalation concentrations for the industries and sites covered by this scenario, as this scenario is based on the typical exposure and work patterns that occur for brake services. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a slight to moderate estimate of exposures.
Industrial and commercial non-aerosol cleaning/ degreasing	Slight to Moderate	For this OES, EPA did not identify inhalation exposure monitoring data related to the use of 1,2-dichloroethane in non-aerosol degreasers. Based on available data, EPA uses surrogate data from TCE during batch open-top vapor degreasing. The dataset, obtained from NIOSH HHEs, contained 113 samples for workers and 10 samples for ONUs, and encompassed various industries. It had a high data quality rating from the systematic review process. The strength of these data includes the number of samples, and the applicability to possible 1,2-dichloroethane activities. TCE and 1,2-dichloroethane also have a similar vapor pressure (73.5 mm Hg vs. 78.9 mmHg for 1,2-dichloroethane), adding to the confidence that TCE is an appropriate surrogate. The primary limitations include: (1) the data are for a different chemical, which will cause inherent uncertainties due to differences in the chemical properties; and (2) EPA conservatively assesses vapor degreasing as the method of non-aerosol cleaning/degreasing with the highest exposure potential; however, EPA does not have evidence that 1,2-dichloroethane is used in vapor degreasing. Additionally, the Agency assumed 250 exposure days/year based on exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations of the air concentrations, EPA concluded that the weight of scientific

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
		evidence for this assessment provides a slight to moderate estimate of exposures.
Industrial and commercial aerosol products	Slight	For this OES, EPA did not identify relevant inhalation monitoring data and used modeling to estimate occupational exposures. Due to expected similarities in worker activity (both spray applications), the Agency used the same method used for the Application of lubricants and greases OES. EPA used EPA/OPPT models combined with Monte Carlo modeling to estimate inhalation exposures. The Monte Carlo simulation with 100,000 iterations used the range of input parameters to generate the distribution of potential exposures. Various model parameters were derived from a CARB brake service study, having a high data quality rating from the systematic review process, and 1,2-dichloroethane concentration data from SDSs of various products. EPA considered the assessment approach, the quality of the data used in the model, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation air concentrations. A strength of the Monte Carlo modeling approach is that capturing the range of model input values and the resulting distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. Other strengths of this model include the use of parameters derived from applicable exposure scenarios such as the CARB brake service study, and the use of known 1,2-dichloroethane concentration data from products currently on the market. The primary limitations include the uncertainty of the representativeness of modeled air concentrations toward the true distribution of inhalation concentrations for the industries and sites covered by this scenario, as this scenario is based on the typical exposure and work patterns that occur for brake services. EPA had very limited information on the applications of 1,2-dichloroethane for this COU. The OES selected was to model 1,2-dichloroethane as an aerosol product applied in brake servicing. Due to the lack of monitoring data and the uncertainty in the OES modeled for this COU, EPA concluded that the weight of scientific evidence for this assessment provides an estimate of exposure of slight confidence.
Laboratory use	Moderate	For this OES, EPA had inhalation data provided via a test order submission from Vinyl Institute, which included manufacturers and processors of 1,2-dichloroethane. Inhalation data from the worker description “laboratory technicians” were used as analogous in this assessment. EPA also reviewed additional inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide (BASF, 2021). This study contained 6 worker personal sample data points where metadata implied laboratory work. The worker data is within the same order of magnitude as the data from the laboratory data from the Vinyl Institute test order. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. EPA used inhalation data to assess inhalation exposures. The primary strength of these data is that they are PBZ and

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Laboratory use *(continued)*	Moderate *(continued)*	capture many tasks that are expected to occur in a commercial laboratory setting. The primary limitations include (1) the data are for laboratory technicians in a manufacturing setting, rather than a commercial setting, and so the dataset may contain exposure from activities or environments that would not occur in a commercial setting; and (2) the lack of data for ONUs. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for laboratory use and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. EPA assigns a lower confidence of slight to moderate for the ONU estimate.
Waste handling, treatment, and disposal	Landfill: slight POTW, non-POTW WWT: moderate	***Waste Handling, Treatment, and Disposal (Landfill) Inhalation Assessment*** For this OES, EPA had limited area data (12 samples) that was used in this assessment. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. EPA used 1,2-dichloroethane inhalation data to assess inhalation exposures, having a medium data quality rating from systematic review. The primary strength of these data is that they are directly applicable concentration data that portray the concentration of 1,2-dichloroethane in the air at 3 locations around an active landfill. The primary limitations of these data are (1) the age of the data (samples taken in 1989 and 1990); (2) only area samples were available as opposed to PBZ air concentration data; (3) the data come from a non-U.S. facility (Greece), which may not be representative of U.S. facilities; and (4) the data are from a single landfill, which may not be representative of all landfills as pollutant concentrations surrounding a landfill can vary depending on the composition and structure of the landfill. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a slight estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for disposal by landfill and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. EPA also has slight confidence in the ONU estimate than the workers estimate. ***Waste Handling, Treatment, and Disposal (POTW, Non-POTW WWT) Inhalation Assessment***

OES	Confidence Rating	Weight of Scientific Evidence Conclusion in Occupational Inhalation Exposure Estimates
Waste handling, treatment, and disposal *(continued)*	Landfill: slight POTW, non-POTW WWT: moderate *(continued)*	For this OES, EPA had limited summary statistics based on PBZ monitoring data (18 samples) that were used in this assessment. EPA considered the assessment approach, the quality of the data, and uncertainties in assessment results to determine a weight of scientific evidence conclusion for the 8-hour TWA inhalation exposure estimates. The Agency used 1,2-dichloroethane inhalation data to assess inhalation exposures, having a high data quality rating from systematic review. The primary strength of these data is the use of directly applicable PBZ data obtained from workers at a wastewater treatment plant. The data represent exposure due to several processes that commonly occur at wastewater treatment plants. The primary limitations of these data are: (1) only summary statistics were available in the study as opposed to discrete measurements; (2) the data comes from a non-U.S. facility, which may not be representative of U.S. facilities; and (3) the data were from only one facility. Additionally, EPA assumed 250 exposure days/year based on 1,2-dichloroethane exposure each working day for a typical worker schedule; it is uncertain whether this captures actual worker schedules and exposures. Based on these strengths and limitations, EPA concluded that the weight of scientific evidence for this assessment provides a moderate estimate of exposures. For ONUs, the Agency did not identify data or modeling approaches applicable to estimation of ONU exposure for disposal by wastewater treatment and used a default assumption of the central tendency from the workers inhalation exposures to represent ONU inhalation exposures. EPA assigns a lower confidence of slight to moderate for the ONU estimate.

EPA estimated dermal exposures using modeling methodologies, which are supported by moderate evidence. The Agency used the EPA Dermal Exposure to Volatile Liquids combined with Monte Carlo modeling to calculate the dermal retained dose. EPA used data on 1,2-dichloroethane for the fraction absorption parameter (Labcorp Early Development, 2024) and OES-specific data for the weight percent parameter in the model. A strength of the Monte Carlo modeling approach is that inclusion of the range of data-informed model input values resulting in a distribution of potential exposure values is more likely than a discrete value to capture actual exposure at sites. The primary limitation is the uncertainty in the representativeness of values toward the true distribution of potential dermal exposures. Therefore, the weight of scientific evidence for the modeling methodologies specifically for all OES is moderate.

Note that EPA did not assess dermal exposures to ONUs as the Agency does not expect ONUs to directly handle 1,2-dichloroethane as part of their duties, and thus ONUs are not expected to have routine dermal exposures during the course of their work. Depending on the COU, ONUs may have incidental dermal exposures due to surface contamination but EPA did not consider these exposures to be significant and thus they were not assessed.

5.1.2 Consumer Exposures

The following subsections describes EPA's approach for assessing consumer exposures and provides exposure assessment results for the single consumer COU, Use of plastic and rubber consumer objects. The *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q) provides additional details on the development of approaches and the exposure assessment results.

5.1.2.1 Summary of Consumer Exposure Scenarios

The three articles identified to emit 1,2-dichloroethane were the following: imported molded plastic Christmas ornaments, molded plastic lamp base, and squishy toys. Each of these articles are available to U.S. consumers as cited in the studies measuring 1,2-dichloroethane emissions and exposures from these articles. The molded plastic ornaments cited in (Doucette et al., 2010) consisted of five plastic ornaments imported from China, which contained and emitted 1,2-dichloroethane. The study did not identify how representative these ornaments are of imported Chinese ornaments available at large. However, the study described the ornaments as plastic figures that resembled toys and EPA therefore modeled Christmas ornaments exposures for children as toys. The molded plastic lamp base and squishy toys only consisted of imported articles. The distribution of these three articles across the United States is unknown, and though EPA cannot identify the number of impacted consumers who could be exposed to 1,2-dichloroethane through use of these articles, the Agency did evaluate these as general exposure scenarios.

EPA evaluated inhalation, dermal and oral exposures for the consumer pathway. The Agency did distinguish children as users of toys and specifically dermal and oral exposures whereas adults were exposed only via inhalation as bystanders. Table 5-9 summarizes the consumer COUs, exposure scenarios, and exposure routes for each of the three consumer articles identified above.

Table 5-9. Summary of Consumer COUs, Exposure Scenarios, and Exposure Routes

Consumer Use Category	Consumer Uses Sub-Category	Article	Exposure Scenario	Routes		
				Inhalation	Dermal	Oral (Mouthing)
Plastic and rubber products	Plastic and rubber products	Molded plastic Christmas ornaments	One or more ornaments are purchased and brought into a home	X	X	X
		Molded plastic lamp base	A new lamp is brought into the home	X		
		Squishy toys	A collection of toys is brought into a home	X	X	X

5.1.2.2 Summary of Inhalation Exposure Assessment

As described in the *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q), two approaches were used to evaluate inhalation exposure from the three articles evaluated (Christmas ornaments, lamp bases, and squishy toys) depending on the information available. For the Christmas ornaments and lamp bases, EPA utilized the Indoor Environmental Concentrations in Buildings with Conditioned and Unconditioned Zones (IECCU) Model Version 1.1 (U.S. EPA, 2019) to estimate exposures to 1,2-dichloroethane via the inhalation route. For squishy toys, chamber concentrations measured by the Danish EPA (Danish EPA, 2018) were found in the literature and used directly to estimate exposures to 1,2-dichloroethane via the inhalation route. For all three articles, air concentrations were estimated for a 1-year period.

5.1.2.3 Summary of Dermal Exposure Assessment

Dermal exposure to 1,2-dichloroethane from Christmas ornaments and squishy toys were evaluated in the *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q). EPA modeled dermal exposures assuming transfer of emitted 1,2-dichloroethane directly to skin during contact. Key parameters for this exposure modeling approach include surface specific emission rate (μg/cm^2-h), contact time (h), contact surface area (cm^2), and contact frequency (day^{-1}, year^{-1}).

5.1.2.4 Summary of Oral Exposure Assessment

As described in the *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q), oral exposure to 1,2-dichloroethane due to mouthing from Christmas ornaments and squishy toys were evaluated in that assessment. Because the ornaments were identified in a study as emitting 1,2-dichloroethane and described as plastic figures that resembled toys, EPA modeled Christmas ornaments exposures for children as toys. The Agency modeled oral exposures assuming transfer of emitted 1,2-dichloroethane directly to the oral cavity during mouthing. Emissions were assumed to fully transfer to saliva and be ingested, in a closed mouth, mouthing scenario. Key parameters for this exposure modeling approach are surface specific emission rate (μg/cm^2-h), mouthing time (h), article area mouthed (cm^2), and mouthing frequency (day^{-1}, year^{-1}). Mouthing time is based on data in EPA's *Children's Exposure Factors Handbook* (U.S. EPA, 2008). Both Christmas ornaments and squishy toys were assumed to be mouthed once per day. Christmas ornaments were assumed to be mouthed 30 days per year (during play time) and squishy toys assumed to be mouthed 365 days per year (again during playtime).

Table 5-10 presents a summary of exposures to 1,2-dichloroethane for all routes and exposure scenarios. In general, 1,2-dichloroethane doses were highest in the younger age groups (infants and toddlers) and lowest for adults. This is expected due to compounding physical and behavioral differences between the age groups—specifically, infants and toddlers who are more likely to handle, play, and mouth these items for a longer duration than adults.

Table 5-10. Inhalation, Ingestion, and Dermal Doses of 1,2-Dichloroethane (µg/kg-day) for Chronic, Acute, and Intermediate Exposure Windows

Representative Article	Exposure Route	Infants	Toddlers	Pre-Schoolers	Middle Childhood	Young Teens	Teenagers	Adults
Chronic average daily dose (CADD) (µg/kg-day)								
Lamp base	Inhalation	0.59	0.56	0.45	0.32	0.22	0.19	0.15
Ornaments	Inhalation	0.12	0.11	0.09	0.06	0.05	0.04	0.03
Ornaments	Dermal	0.31	0.27	0.23	0.19	0.15	–	–
Ornaments	Mouthing	0.64	0.37	0.24	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	0.08	0.06	0.05
Squishy toys	Dermal	0.07	0.06	0.05	0.04	0.03	–	–
Squishy toys	Mouthing	0.11	0.03	0.01	–	–	–	–
Acute dose rate (ADR) (µg/kg-day)								
Lamp base	Inhalation	1.18	1.11	0.90	0.63	0.44	0.38	0.31
Ornaments	Inhalation	2.25	2.12	1.72	1.20	0.85	0.72	0.58
Ornaments	Dermal	3.81	3.26	2.82	2.27	1.79	–	–
Ornaments	Mouthing	7.79	4.53	2.90	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	0.08	0.06	0.05
Squishy toys	Dermal	0.07	0.06	0.05	0.04	0.03	–	–
Squishy toys	Mouthing	0.11	0.03	0.01	–	–	–	–
Intermediate average daily dose (µg/kg-day)								
Lamp base	Inhalation	1.12	1.05	0.86	0.60	0.42	0.36	0.29
Ornaments	Inhalation	0.45	0.42	0.34	0.24	0.17	0.14	0.12
Ornaments	Dermal	3.81	3.26	2.82	2.27	1.79	–	–
Ornaments	Mouthing	7.79	4.53	2.90	–	–	–	–
Squishy toys	Inhalation	0.20	0.19	0.15	0.11	0.08	0.06	0.05
Squishy toys	Dermal	0.07	0.06	0.05	0.04	0.03	–	–
Squishy toys	Mouthing	0.11	0.03	0.01	–	–	–	–

5.1.2.5 Weight of Scientific Evidence Conclusions for Consumer Exposure

EPA used data extracted from peer-reviewed literature and a previous assessment on emissions of 1,2-dichloroethane from articles, specifically a lamp base, ornaments, and squishy toys. In estimating inhalation, dermal, and oral exposures, the Agency based exposures on 1,2-dichloroethane emission data from each of the articles and corresponding scenarios per life stage as found in EPA's *Exposure Factors Handbook* (also referred to as "the Handbook") (U.S. EPA, 2011a). The Agency characterized high-end exposures by choosing parameters such as duration and frequency of exposures to each of the three articles at the higher-end of the distribution presented in the Handbook. In presenting the higher-end exposures for adult inhalation and children's dermal, ingestion, and inhalation exposure scenarios, EPA has robust confidence that risk estimates will be protective of both children's and adults' exposures to articles containing 1,2-dichloroethane.

5.1.3 General Population Exposures

General population exposures occur when 1,2-dichloroethane is released into the environment and the media is then a pathway for exposure. Figure 5-2 provides a graphic representation of where and in which media 1,2-dichloroethane is estimated to be found and the corresponding route of exposure. As described in Section 3.2, releases of 1,2-dichloroethane are expected in air, water, and disposal to landfills. Section 3.3 provides a summary of the monitoring, database, and modeled data on concentrations of 1,2-dichloroethane in the environment.

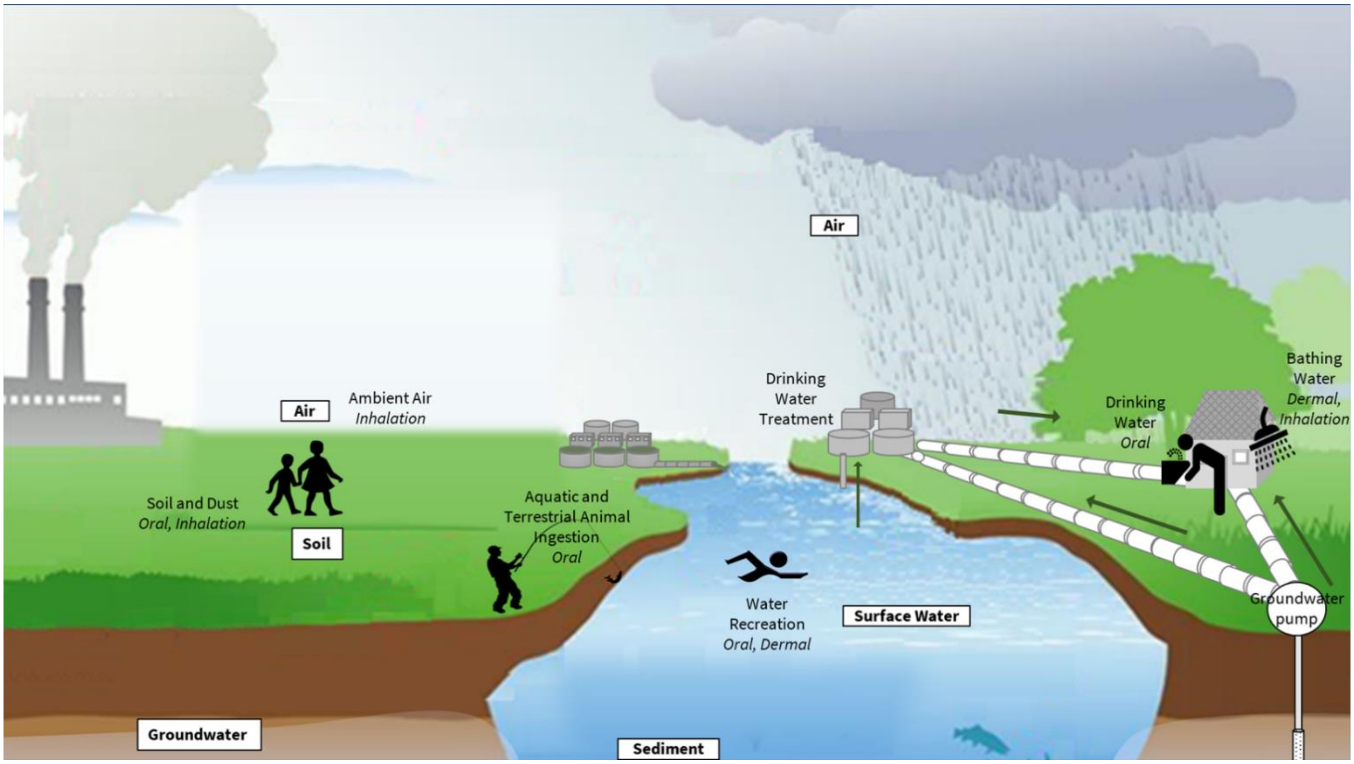

Figure 5-2. Potential Human Exposure Pathways to 1,2-Dichloroethane for the General Population

5.1.3.1 Summary of Inhalation Exposure Assessment

EPA estimated ambient air concentrations of 1,2-dichloroethane using AERMOD and HEM. Based on the ambient air exposure analysis performed for the *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj), the Agency did not perform a tiering analysis for 1,2-dichloroethane. For 1,1-dichloroethane, the tiering analysis performed resulted in EPA using the most refined approach available at the time because cancer risk estimates exceeding the benchmark were found in the lower-tier analyses. Because 1,1- and 1,2-dichloroethane use the same IUR and reported releases of 1,2-dichloroethane to ambient air are higher than those of 1,1-dichloroethane, EPA only performed the highest-tier of exposure analysis available. For this analysis, the Agency used a combination of AERMOD and HEM to estimate ambient air exposures to the general population as these two models are the highest-tier models currently used by EPA for estimating ambient air concentrations and exposures from industrial point and area sources.

AERMOD was used to estimate exposures using a multi-year analysis for releases from TRI reporting facilities (2015–2020), NEI reporting facilities (2014 and 2017), and generic facilities/sites. Through modeling of multiple years of releases across multiple databases, EPA has higher confidence that all relevant releases were captured in its analysis relative to an analysis that used only one source of release data. AERMOD does not consider populations that may or may not be living near releasing facilities.

Therefore, EPA ran HEM to characterize populations living near 1,2-dichloroethane-releasing facilities. HEM combines 2010 U.S. Census data with estimated ambient air concentrations to calculate maximum individual risks (MIR) and the number of people within each census block with a cancer risk estimate exceeding 1×10^{-6}, 1×10^{-5}, and 1×10^{-4}. HEM was run using TRI data from either 2018, the year with the highest overall releases, or the highest release year from 2015 to 2021 for facilities not reporting in 2018. EPA only modeled TRI-reported releases using HEM because TRI releases generally capture high-end releases that are health protective and tend to drive exposure (and associated risks). Section 5.3.8.2 and Table 5-35 contain an analysis of populations living near releasing facilities for those OESs with only NEI-reported releases. Detailed descriptions of modeling using AERMOD and HEM are provided in the *Draft Environmental Media Assessment for 1,2-Dichloroethane*(U.S. EPA, 2025af) and the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj). EPA also compared modeled data to monitored data reported to the AMTIC archive and did a case study focusing on a releasing facility in Calvert City, Kentucky, to ground truth modeling results (see *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af)).

Releases Used as Modeling Inputs for AERMOD and HEM

For modeling, OESs fell into one of the following three categories:

- OESs for which there were only facility-reported releases (Manufacturing; Repackaging; Processing as a reactant; Processing into formulation, mixture, or reaction product; and Industrial application of lubricants and greases; and Waste handling, treatment, and disposal);
- OESs for which there were only modeled releases from generic facilities/sites (Commercial aerosol products); and
- OESs for which there were both modeled releases from generic facilities/sites and reported releases (Industrial application of adhesives and sealants; Non-aerosol cleaning and degreasing; and Laboratory use).

When using AERMOD, the Agency modeled all reported releases from TRI from the reporting years of 2015 to 2020, all reported releases from NEI from the reporting years of 2014 and 2017 as well as all EPA-estimated releases for generic facilities/sites.

HEM was run using TRI data for either releases reported for 2018, the highest overall release year of the years analyzed in this evaluation, or the highest release from 2015 to 2021 for facilities that did not report releases in 2018. Detailed descriptions of the modeling efforts using AERMOD and HEM with full model inputs are provided the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) and the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

Calculation of Exposures via Ambient Air Based on Results from AERMOD

For all AERMOD modeling, the 10th, 50th, and 95th percentile daily and annual average concentrations were calculated for each facility. The AERMOD modeling methodology is described in full in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) and the full exposure calculations are presented in the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj). When calculating exposures to ambient air using results from AERMOD, EPA assumed that a person is exposed to ambient air at the modeled distance for 24 hours per day. For lifetime exposures, the Agency assumed a lifetime and exposure duration of 78 years. These assumptions represent a high-end exposure scenario that do not account for the potential mobility (*e.g.*, people going to work, spending time indoors, moving residences over a lifetime) of people living near 1,2-dichloroethane-releasing facilities (see *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj) for more information). AERMOD was used to estimate exposures using a multi-year analysis for releases from TRI reporting facilities (2015–2020), NEI-reporting facilities (2014 and 2017), and EPA-modeled releases for generic facilities/sites. Through modeling of multiple years of releases across multiple databases, EPA increases its confidence that all relevant releases were captured in its analysis.

Calculation of Exposures via Ambient Air Based on Results from HEM

HEM was used to estimate exposures and risks at centroids of census block up to 50,000 m from TRI-reporting facilities. When available, EPA used releases reported in TRI Form R for 2018 to model ambient air concentrations and exposures using HEM. For TRI Form R-reporting facilities that did not report in 2018, the highest release from 2015 to 2021 was used. The year 2018 was chosen as the primary year for HEM modeling because it had the highest overall releases from 2015 to 2021; therefore, the exposures calculated from HEM represent higher-end exposure scenarios for populations living withing 50,000 m of releasing facilities. When using HEM to estimate exposures to ambient air, EPA used the default chronic exposure scenario, which assumes that an individual breathes the ambient air at a given receptor site (*i.e.*, census block centroid) 24 hours per day over a 70-year lifetime (SC&A, 2023). HEM was used to estimate ambient air concentrations, in addition to AERMOD, because AERMOD does not account for populations who may or may not be living near releasing facilities, which is an essential consideration for determination of risk. Therefore, EPA ran HEM to characterize populations living near releasing facilities. As stated above, AERMOD does not consider populations who may or may not be living near releasing facilities. Therefore, EPA ran HEM to characterize populations living near 1,2-dichloroethane releasing facilities. The Agency modeled TRI-reported releases using HEM because TRI releases represent high-end releases and were determined to be the largest contributors to general population exposures based on the analysis using AERMOD. Although exposures calculated by HEM will be similar to those calculated using AERMOD, there will be slight differences because modeling using HEM uses a conglomeration of releases from multiple years in a single model run.

Results of Exposure Modeling

Lifetime average daily concentrations modeled using AERMOD program for TRI and NEI reporting facilities based on the 95th percentile of the maximum exposures across all facilities ranged from 0 to 6.4 $\mu g/m^3$ and 0 to 4.6 $\mu g/m^3$, respectively, at 1,000 m from releasing facilities. Analysis using HEM showed that the nearest census block centroids to releasing facilities reporting to TRI ranged from 151 to 19,909 m, with a median of 1,136 m. For generic facilities/sites that were modeled using EPA-estimated releases, lifetime average daily concentrations ranged 3.80×10^{-6} to 36 $\mu g/m^3$ at 1,000 m when using the meteorology station of Lake Charles, Louisiana. The seven orders of magnitude difference in these modeled concentrations is due to the differences in characteristics of the OESs modeled (Table 3-6). Additional exposures can be found in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af).

Comparison of Modeled Ambient Air Exposures Using AERMOD to Monitored Data

To support the modeled ambient air exposures, EPA extracted and summarized monitoring data for 1,2-dichloroethane from EPA's AMTIC database (U.S. EPA, 2002)—a collection of data from air monitoring networks located across the United States (U.S. EPA, 2025af). EPA also identified and summarized measured data from peer-reviewed literature, gray literature, and databases that were included in EPA's systematic review process, as detailed in the *Draft Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2025bd). As described in Section 3.3.1, EPA compared modeled ambient air concentrations for a facility in Calvert City, Kentucky, to measured concentrations from monitoring conducted near the facility as reported in the AMTIC archive (U.S. EPA, 2002) and in a separate risk evaluation prepared by the Agency, titled "Calvert City, Kentucky Volatile Organic

Compound (VOC) Air Quality Risk Assessment" (U.S. EPA, 2024a). This facility was chosen for comparison because it was the highest releasing facility based on TRI reporting and because of availability of monitoring data for comparison.

The comparison showed that the modeled 95th percentile average daily concentrations and the maximum one-day monitored 1,2-dichloroethane concentrations from the AMTIC archive were within an order of magnitude of each other when the monitoring location was within 300 m of the modeled distance. The monitoring site from the separate risk evaluation performed by the Agency with the highest measured 1,2-dichloroethane concentrations was located 370 m from the facility and reported concentrations ranging from 4.29×10^{-2} to 221 µg/m^3 (mean 22.1 µg/m^3) with a detection frequency of 99 percent. The two other sampling sites were located approximately 1,900 and 2,500 m from the facility and had reported concentrations of 5.91×10^{-2} to 15.4 µg/m^3 (mean 1.6 µg/m^3) and 2.83×10^{-2} to 11.2 µg/m^3 (mean 1.1 µg/m^3). For comparison, the modeled 95th percentile concentrations for this facility were 3.4 and 0.75 µg/m^3 at 1,000 and 2,500 m based on the 2020 TRI-reported releases. Additionally, the modeled 50th percentile concentrations for this facility were 1.6 and 0.34 µg/m^3 at 1,000 and 2,500 m, respectively, based on the 2020 TRI-reported releases. Overall, the similarity between the modeled and measured values increases the certainty in the model inputs and methodology used in this evaluation.

5.1.3.2 Summary of Dermal Exposure Assessment

Dermal exposure of the general population to 1,2-dichloroethane may occur through swimming in surface water (streams and lakes) containing 1,2-dichloroethane due to facility releases of 1,2-dichloroethane to those surface waters. Dermal doses were calculated using the highest 1,2-dichloroethane surface water concentration for each OES resulting from the corresponding facility-specfic discharges However, the highest 1,2-dichloroethane releases associated with each of the OESs are in highly industrialized areas and swimming in these areas such as in the Westlake, Louisiana, discharge location is not anticipated to occur on a chronic basis given contaminated waterways and published warnings and advisories against swimming.

The supplemental file, *Draft Drinking Water Exposure Estimates for 1,2-Dichloroethane*, (U.S. EPA, 2025ac) presents the surface water concentrations used to estimate acute doses (ADR) from dermal exposure while swimming. Table 5-11 summarizes the derived acute doses (ADRs) resulting from dermal exposure while swimming for adults, youth, and children. Children younger than 6 years are not assumed to be swimming in receiving water bodies where facility releases occur. Of the OESs listed in Table 5-11, the highest dermal exposures are anticipated for adults from Waste handling, treatment, and disposal followed by Manufacturing OES releases.

Table 5-11. Acute Dermal (Swimming) Doses Across Life Stages

OES/ Scenario	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)
Manufacturing	1.9E03	1.1E03	1.5E−03	1.2E−03	7.2E−04
Processing/Processing as a reactant	2.1E02	1.3E02	1.7E−04	1.3E−04	8.0E−05
Processing/Processing aid	1.2E01	1.2E01	9.7E−06	7.4E−06	4.5E−06

OES/ Scenario	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ years)	Youth (11–15 years)	Child (6–10 years)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)
Waste handling, treatment, and disposal/POTW	1.4E03	5.3E02	1.1E−03	8.5E−04	5.1E−04
Waste handling, treatment, and disposal	2.6E03	1.4E03	2.1E−03	1.6E−03	9.7E−04
30Q5 = 30 consecutive days of lowest flow over a 5-year period; ADR = acute dose rate (acute exposures); POT = potential; POTW = publicly owned treatment works					

5.1.3.3 Summary of Oral Exposures Assessment

Facilities reported 1,2-dichloroethane releases to surface waters from process wastewater discharges and to soil from biosolids application. 1,2-Dichloroethane concentrations in both surface water and soil can also be impacted by deposition from ambient air. Once in these media, the fate, physical and chemical, and transport properties (U.S. EPA, 2025p) indicate 1,2-dichloroethane can partition to each media, which in turn can lead to general population exposure to 1,2-dichloroethane via drinking water, incidental ingestion from swimming in receiving water bodies, and soil ingestion. However, the levels of exposure via the oral route are anticipated to be less than that via inhalation; thus, EPA conducted a screening analysis of the highest exposures resulting from facility-reported releases. The *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) describes the methodology and results of estimation of surface water concentration from facility-specific releases.

As described in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af), 1,2-dichloroethane facility-specific releases are monitored and permitted via NPDES permits; therefore, EPA can estimate concentrations in the receiving water bodies at the point of discharge of facilities reporting releases of 1,2-dichloroethane. EPA uses the NHDPlus flow data of the receiving water body together with the amount of 1,2-dichlorethane reported in the effluent to estimate concentrations. Since flow metrics vary, EPA uses a low flow 7Q10 metric as a conservative metric for aquatic species assessment. For general population exposures from drinking water or incidental ingestion via swimming in the receiving water body as described in Sections 5.1.3.3.1 and 5.1.3.3.2 below, EPA uses the 30Q5 flow metric.

5.1.3.3.1 Drinking Water Exposure

In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine safe levels of chemicals in drinking water that do or may cause health problems. The Agency has set an enforceable standard called a Maximum Contaminant Level (MCL) for 1,2-dichloroethane at 5 parts per billion (ppb). All public water supplies must abide by these regulations. As noted above, 1,2-dichloroethane is reported by facilities as released to surface waters from COUs. EPA refined the drinking water estimates for those facilities that discharge to surface waters that are potential sources of drinking water. That is, the TSCA-reported releases are upstream of a drinking water intake location estimated the possible exposures resulting from these specific releases at the point of discharge. If EPA identified a downstream drinking water intake location from the release site, the Agency refined the exposure estimates by considering the amount of dilution occurring from the releasing facility discharge point to the drinking water intake location. Receiving water bodies with no downstream drinking water intakes were assumed not to be sources of drinking water, and the corresponding facility releases were not included in the drinking water analysis.

Modeling Approach

To model drinking water concentrations at the point of drinking water treatment facility intake locations, EPA started with the upstream TSCA facility surface water concentrations estimated at the facility's point of release. Modeled surface water concentrations estimation methodology and results are presented in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af). The receiving water bodies were reviewed if they were potential sources of drinking water through a downstream drinking water intake analysis. EPA searched for drinking water intake locations within 250 km downstream of releasing facilities and calculated the 1,2-dichloroethane diluted surface water concentration based on distance from release to the drinking water intake and the streamflow (see *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) for details). If there were no downstream drinking water intake locations within the 250 km distance, EPA considered there were no drinking water exposures resulting from the facility releases. Therefore, the Agency focused the analysis on those facilities and corresponding COUs with potential drinking water exposures.

EPA presents in the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj) acute and chronic exposure estimates for adults and bottle-fed infants. In including infant exposures estimates, EPA is considering PESS and protecting these sensitive subpopulations. Of 33 manufacturing facilities reporting releases of 1,2-dichloroethane to surface waters, EPA identified 7 manufacturing facility releases that were associated with possible downstream drinking water intakes. Therefore, the Agency estimated exposures for those seven facilities, and Table 5-12 summarizes the drinking water doses for adults and infants from the facility with the highest downstream drinking water intake concentration for the manufacturing COU. The other six facilities had lower downstream concentrations and resulting lower doses and were therefore not summarized in the table. All exposure estimates are provided in the *Draft Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2025ac). For the other four COUs, EPA is also presenting the highest exposure estimates within each COU as well as the associated releasing facility that is the source of the corresponding exposures.

Table 5-12. Drinking Water Exposures to 1,2-Dichloroethane from Highest Concentration at a Drinking Water Intake per COU

Scenario	Diluted Harmonic Mean Surface Water Concentrations (µg/L)	Diluted 30Q5 Surface Water Concentrations (µg/L)	Adult (21+ years)			Infant (Birth to <1 year)		
			ADR$_{POT}$ (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)	ADR$_{POT}$ (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)
Manufacturing (KY0003484)	4.6E−03	8.6E−03	3.4E−07	4.9E−08	3.6E−08	1.2E−06	1.2E−07	9.1E−08
Processing/ Processing as a reactant (WV0073202)	2.7E−04	3.7E−04	1.5E−08	2.9E−09	2.1E−09	5.2E−08	7.4E−09	5.4E−09
Processing/ Processing aid (NJ0004952)	6.2E−04	1.2E−03	4.6E−08	6.5E−09	4.7E−09	1.6E−07	1.7E−08	1.2E−08
Waste handling, treatment, and disposal/ POTW (CA0048127)	0.537	5.57	2.2E−04	5.7E−06	4.1E−06	7.9E−04	1.4E−05	1.1E−05

Scenario	Diluted Harmonic Mean Surface Water Concentrations (µg/L)	Diluted 30Q5 Surface Water Concentrations (µg/L)	Adult (21+ years)			Infant (Birth to <1 year)		
			ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADD (mg/kg-day)	LADD (mg/kg-day)
Waste handling, treatment, and disposal (OK0040789)	29.6	55.6	2.2E−03	3.1E−04	2.3E−04	7.9E−03	8.0E−04	5.8E−04
30Q5 and harmonic mean receiving water flow values used to calculated ADR and ADD. Drinking water intake locations within 250 km of releasing facility were considered. Surface water concentrations at the intake location were calculated based on stream flow and distance from facility effluent release.								

Monitoring Information

As presented in detail in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af), EPA searched peer-reviewed literature, gray literature, and databases of environmental monitoring data to obtain concentrations of 1,2-dichloroethane in drinking water. Drinking water quality data from 2011 through 2022 were obtained from the California Water Boards (2022) for 39 counties in that state. For the more than 200 active, inactive, or proposed water systems and facilities, 1,2-dichloroethane was detected above the MCL in a single sample (1 µg/L) out of 67,036 records. The highest level of 1,2-dichloroethane was detected in a 2022 sample from an active California Domestic Water Company well in Los Angeles.

Because 1,2-dichloroethane is a regulated chemical under the SDWA, EPA has collected results of U.S. public water system's finished water sampling data. Based on the national occurrence data listed in EPA's 2024 fourth Six-Year Review (SYR4) of National Primary Drinking Water Regulations (NPDWRs), 1,2-dichloroethane is rarely detected above the 1,2-dichloroethane Minimum Reporting Level (MRL) and even less above the Maximum Contaminant Level (MCL) of 5 parts per billion (U.S. EPA, 2023b). Across the public water systems, 0.57 percent detected 1,2-dichloroethane as reported in the SYR4. This frequency of detection of 1,2-dichloroethane in public drinking water systems has historically been low but has decreased over time with a 1.31 percent detection in the SYR1 in 2003 and 0.75 percent in SYR2 in 2010. In addition, the SYR4 reported that 0.05 percent systems detected 1,2-dichloroethane above the MCL. The SYR4 also presents data in terms of sample occurrence: that is, 0.44 percent of samples detected 1,2-dichloroethane and 0.01 percent were above the MCL.

Evidence Integration

Facilities report releases of 1,2-dichloroethane to surface water per permit requirements. The permits undergo public comment prior to finalization and are available publicly via the Pollutant Loading Tool (see *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af)). EPA's Office of Ground Water and Drinking Water has determined the 1,2-dichloroethane human health limit in drinking water as 5 µg/L (accessed November 12, 2025). In order to assess the impacts of COU activities and releases on drinking water sources, EPA conducted a facility-specific analysis of drinking water estimates downstream of facility releases. These estimates are considered conservative in that only dilution was considered in calculating the surface water concentration at the point of drinking water intakes. Processes such as volatilization within the receiving water flow as well as within the drinking water treatment facility were not quantified and would further decrease the concentrations of 1,2-dichloroethane in finished drinking water. EPA concludes that for all facilities releasing 1,2-

dichloroethane upstream of drinking water intakes, the downstream surface water concentration is well below the drinking water limit.

5.1.3.3.2 Incidental Ingestion from Swimming

The general population may swim in surface waters (streams and lakes) that could contain 1,2-dichloroethane from facility releases under COUs. As a screening, the highest modeled surface water concentrations per OES included in the *Draft Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2025ac) were used to estimate acute doses (ADR) resulting from incidental ingestion of 1,2-dichloroethane while swimming in the receiving water body. The highest 1,2-dichloroethane releases associated with each of the OESs are in highly industrialized areas and swimming in these areas such as in the Westlake, Louisiana, discharge location is not anticipated to occur on a chronic basis given contaminated waterways and published warnings and advisories against swimming.[11]

Table 5-13 summarizes the derived acute doses (ADRs) resulting from incidental oral exposure while swimming for adults, youth, and children. Children younger than six are not assumed to be swimming in receiving water bodies where facility releases occur. Oral doses were calculated using the highest 1,2-dichloroethane surface water concentration for each OES resulting from the corresponding facility-specfic discharges. Of the OESs in Table 5-13, the highest oral exposures are anticipated for adults from Waste handling, treatment, and disposal followed by Manufacturing OESs releases.

Table 5-13. Acute Oral (Incidental Ingestion from Swimming) Doses Across Life Stages

Scenario	1,2-Dichloroethane Surface Water Concentrations		Adult (21+ Years)	Youth (11–15 Years)	Child (6–10 Years)
	30Q5 Conc. (µg/L)	Harmonic Mean Conc. (µg/L)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)	ADR_{POT} (mg/kg-day)
Manufacturing	1.9E03	1.1E03	6.7E−03	1.4E−02	5.9E−03
Processing/ Processing as a reactant	2.1E02	1.3E02	7.5E−04	1.2E−03	6.6E−04
Processing/ Processing aid	1.2E01	1.2E01	4.2E−05	6.5E−05	3.7E−05
Waste handling, treatment, and disposal/ POTW	1.4E03	5.3E02	4.8E−03	7.4E−03	4.2E−03
Waste handling, treatment, and disposal	2.6E03	1.4E03	9.0E−03	1.4E−02	7.9E−03

5.1.3.3.3 Incidental Ingestion from Soil (Biosolids and Air Deposition)

EPA considered incidental ingestion (soil pica) of soils contaminated with 1,2-dichloroethane via deposition from ambient air and land application of biosolids for 3- to 6-year-old children.

Concentrations of 1,2-dichloroethane in soils following application of biosolids on agricultural lands were estimated to be 0.63 mg/kg (U.S. EPA, 2025af). A full description of the methods used to estimate concentrations of 1,2-dichloroethane in soils following application of biosolids is provided in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af).

[11] Louisiana swimming advisories can be found at: https://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories (accessed November 10, 2025).

Estimates of 1,2-dichloroethane air deposition to soil are discussed in detail in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af), which presents the range of calculated soil concentrations corresponding to the emission scenarios considered. The highest estimated 95th percentile soil concentration amongst all exposure scenarios was for the Manufacturing OES at 30 m from the releasing facility. The expected intake rate for children aged 3 to 6 years for soil pica (soil ingestion) is 1,000 mg/day (U.S. EPA, 2017). The exposure frequency and exposure duration were both assumed to be 1 year. Mean body weight (18.6 kg) for 3- to 6-year-olds was taken from EPA's *Exposure Factors Handbook* (U.S. EPA, 2011a). Detailed calculations are presented in the *Draft General Population Exposure Assessment* (U.S. EPA, 2025q).

At the estimated 1,2-dichloroethane soil concentration of 0.63 mg/kg due to land application of biosolids, the ADD for a 3- to 6-year-old ingesting 1,000 mg/day of contaminated solids would be 3.39×10^{-5} mg/kg/day. Additionally, at the estimated 1,2-dichloroethane soil concentration of 2.0 mg/kg due to air deposition, the ADD for a 3- to 6-year-old ingesting 1,000 mg/day of contaminated solids would be 1.1×10^{-4} mg/kg/day. EPA acknowledges that the pica scenario is not highly likely among children; however, it is protective of a behavior that is not unusual among young children.

5.1.3.3.4 Fish Ingestion Exposure

General population exposures can occur from catching fish and ingesting fish tissue where 1,2-dichloroethane bioaccumulates from surface water impacted by facility releases of 1,2-dichloroethane. EPA based general population exposure estimates from this pathway of exposure on facility release data, the corresponding 1,2-dichloroethane surface water concentrations, fish tissue concentrations, and the consumption of the affected fish tissue. The Agency focused the analysis on the facility releases with the highest surface water concentrations per OES/COU as that correlates with the highest anticipated exposures (see the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj)).

EPA estimated exposure from fish consumption using age-specific ingestion rates as well as ingestion rates associated with specific lifestyles such as subsistence or Tribal fishing (U.S. EPA, 2011a). The acute dose (ADR) was calculated using the 90th percentile and central tendency IR, respectively. Cancer exposure (LADD, lifetime average daily dose) and risks were also characterized due to the carcinogenic potential of 1,2-dichloroethane (U.S. EPA, 2024b). The *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj) the calculations of fish ingestion doses for adults and toddlers. The inputs and chronic non-cancer estimates can be found in *Draft Fish Ingestion Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025ai). The years within an age group (*i.e.*, 62 years for adults) was used for the exposure duration and averaging time to estimate non-cancer exposure. Table 5-14 presents the exposures calculated using highest estimated 1,2-dichloroethane surface water concentrations per COU/OES resulting from the corresponding facility discharges, with modeled BCF of 4.4 L/kg.

EPA also identified releases of 1,2-dichloroethane to Chinle Wash from the Chinle Wastewater Treatment Facility located on Tribal lands and estimated possible doses of 1,2-dichloroethane from fish ingestion using Tribal consumption rates (2.7 g/day), which are estimated as 10 times higher than the 95th percentile general population consumption rate of fish. This subset of the general population may be considered representative of PESS.

Table 5-14. General Population Fish Ingestion Doses by Surface Water Concentration and COU/OES[a]

COU/OES	1,2-Dichloroethane Surface Water Concentrations (µg/L)	Adult ADR (mg/kg-day)	Young Toddler ADR (mg/kg-day)	Adult LADD (mg/kg-day)
Manufacturing	1.1E03	1.4E−03	2.0E−03	6.9E−03
Processing/Processing as a reactant	1.3E02	1.6E−04	2.3E−04	8.0E−04
Processing/Processing aid	1.2E01	1.5E−05	2.2E−05	7.5E−05
Waste handling, treatment, and disposal/POTW	5.3E02	6.4E−04	9.6E−04	3.3E−03
POTW (NN0020265 Chinle WWTF) [b c]	5.2	6.2E−05	N/A	4.9E−05
Waste handling, treatment, and disposal	1.4E03	1.7E−03	2.5E−03	8.6E−03

[a] General population fish consumption rate: adult = 0.2775 g/kg-day; young toddler (1 to <2 years) = 0.412 g/kg-day (U.S. EPA, 2025bg)
[b] Tribal fish consumption rate: adult only = 2.7 g/kg-day (U.S. EPA, 2025bg)
[c] NPDES permit NN0020265 represents highest concentration of 1,2-dichloroethane from discharges to surface water in Tribal lands.

5.1.3.4 Summary of Inhalation and Dermal Exposure Assessment to Byproducts

Inhalation Exposures to Byproducts in Ambient Air

EPA estimated acute, chronic non-cancer, and cancer risks from exposure to the byproducts for populations living in the vicinity of facilities manufacturing 1,2-dichloroethane via the ambient air pathway using HEM. HEM provides estimates of risks and exposures at centroids of census blocks up to 50 km and discrete radial distances up to 10 km from releasing facilities. HEM calculates an aggregated exposure for each byproduct by accounting for the combined emissions across all modeled facilities in proximity to one another. The *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l) presents the highest cancer risk estimates and the lowest acute and chronic non-cancer risk estimates across all facilities for each byproduct at centroids of census blocks based on 2018 TRI-reported releases. No cancer risk estimates exceeded 1 in a million. Additionally, none of the acute or chronic non-cancer risk estimates were below the benchmarks of 30 or 300, respectively.

EPA also compared the releases of each of the byproduct chemicals reported in previously published, chemical-specific risk evaluations as well as fenceline analyses provided in the estimated byproduct air releases section in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). That comparison showed lower exposures from the byproduct estimates vs. from the manufacture of chemical itself, which supports the reasonableness of the byproduct estimates.

Oral and Dermal Exposures to Byproducts in Surface Water

EPA compared the releases of each of the byproduct chemicals to surface waters reported in the previously published chemical-specific risk evaluations with release estimates from one facility (Eagle 2LLC) that reported releases of 1,2-dichloroethane. Releases of each byproduct chemical were based on the amounts of byproducts formed during 1,2-dichloroethane manufacturing and adjusted for the different removal rates applied during wastewater treatment. Based on the concentrations estimated from byproduct release, general population exposures were estimated as lower than those estimated in the fenceline memoranda for each chemical.

5.1.3.5 Weight of Scientific Evidence Conclusions for General Population Exposure

Ambient Air

The weight of scientific evidence for inhalation exposure estimates is determined by several different evidence streams, including evidence supporting the exposure scenarios (Section 5.1.3.1), release data used as model input data (U.S. EPA, 2025af, g), and agreement between modeled and monitored ambient air concentrations (U.S. EPA, 2025af). The Agency has higher confidence in exposures estimates that are based on facility-reported releases than those based on EPA-estimated releases of 1,2-dichloroethane from generic facilities/sites.

EPA has robust confidence in the applicability of HEM and AERMOD for the purposes of this draft risk evaluation. AERMOD is EPA's regulatory model that has been peer reviewed as part of the regulatory model process described in Appendix W to 40 CFR part 51, whereas HEM conducts dispersion modeling using AERMOD as a compiled executable program. EPA has higher confidence in the physical source specifications used as inputs for modeling of reported releases than those used for modeling of EPA-estimated releases from generic facilities/sites (U.S. EPA, 2025af, g). There are additionally uncertainties when using HEM to characterize populations living near manufacturing/releasing facilities. HEM estimates exposures for the census block centroid, as defined by the U.S. Census Bureau. Values calculated for centroids are not representative of the range of values over the entire block and might not represent where most people reside within a census block. Therefore, estimated exposures using HEM can overestimate or underestimate actual exposures depending on the geographic population distribution within the block. Overall confidence in inhalation exposure estimates resulting from modeled ambient air concentrations are dependent on the OES and range from slight to robust. The OES with the highest overall predicted lifetime average daily concentrations were for Application of adhesives and sealants; however, the highest exposures for this OES were based on modeled releases, and EPA only has slight confidence in the estimated concentrations. The Agency also calculated exposures for the OES of Application of adhesives and sealants based on NEI-reported releases, which were several orders or magnitude lower than the exposures estimated using the EPA-modeled releases for generic facilities/sites. EPA has robust confidence in the exposures calculated using NEI-reported releases for the OES of Application of adhesives and sealants. Of the exposure estimates for which EPA has robust confidence, Manufacturing and processing into formulation mixture, or reaction product had the highest estimated lifetime average daily concentrations.

Surface Water Exposures

EPA considered physical and chemical properties to confirm presence in the water column, and facility-specific release data and monitoring data as evidence to support the following exposure scenarios: oral and dermal exposure estimates from drinking water, incidental oral and dermal from swimming, and fish ingestion exposures.

1,2-Dichloroethane is soluble in water and if released to water will remain in water. NPDES discharge permits require monitoring data to be reported via their DMRs and provide evidence for releases to receiving water bodies. TRI also provides facility-specific water release data. The amount of 1,2-dichloroethane released, as well as receiving water body flow as calculated from EPA's National Hydrography Dataset Plus (NHDPlus) flow database at the point of release, are the principal factors affecting the concentration in the receiving water body and the corresponding levels of exposure.

For exposures via drinking water, releases were considered where they occurred upstream of a drinking water intake location. A dilution due to downstream transport was calculated between location of discharge and drinking water intake. EPA's Office of Ground Water and Drinking Water regulates levels of 1,2-dichloroethane in finished drinking water, and the estimated concentrations at drinking water intakes from TSCA releases prior to treatment are below EPA's regulatory limit.

Land Exposures

EPA investigated the soil ingestion pathway for two scenarios: land application of biosolids as well as deposition from ambient air. For the land application of biosolids scenario, EPA modeled soil concentrations by using the SimpleTreat 4.0 wastewater treatment plant model to estimate concentrations in biosolids and assuming annual applications of biosolids. For air deposition, EPA estimated concentrations in soils using deposition fluxes modeled using AERMOD for TRI-reported releases.

The pica scenario modeled for both land application of biosolids and air deposition is not highly likely among children in agricultural settings (for biosolids application); however, it is protective of a condition among young children. Therefore, overall, EPA has slight confidence in the accuracy of its exposure estimates for incidental ingestion of soils from biosolids and air deposition; however, the Agency has robust confidence that exposure scenarios modeled represent high-end scenarios that are health protective based on conservative assumptions included in this assessment for the oral pathway.

5.1.4 Aggregate and Sentinel Exposure

5.1.4.1 Aggregate Exposures

Section 6(b)(4)(F)(ii) of TSCA requires EPA, as a part of the risk evaluation, to describe whether aggregate or sentinel exposures under the COUs were considered and the basis for their consideration. Furthermore, in the final RE framework rule, the Agency codified at 720.39(d)(8), a requirement that "EPA will consider aggregate exposures to the chemical substance, and, when supported by reasonably available information, consistent with the best available science and based on the weight of scientific evidence, include an aggregate exposure assessment in the risk evaluation, or will otherwise explain in the risk evaluation the basis for not including such and assessment."

In this draft risk evaluation, EPA quantitatively evaluated combined inhalation exposure and risk across multiple TRI facilities in proximity releasing 1,2-dichloroethane to ambient air using HEM (see Section 5.3.6.2). The Agency compared ambient air monitored data (Section 3.3.1), which includes all sources, to concentrations estimated using AERMOD, which does not include an aggregate analysis. The similarity of results ground truth the results of the modeling efforts and show that the primary contributors of ambient air concentrations of 1,2-dichloroethane are the facilities reporting releases of 1,2-dichloroethane in CDR.

5.1.4.2 Sentinel Exposure

EPA defines sentinel exposure as "the exposure from 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 draft risk evaluation, EPA considered sentinel exposures by considering risks to human populations who may have upper-bound exposures; for example, workers and ONUs who perform activities with higher exposure potential or certain physical factors like body weight or skin surface area exposed. EPA 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.

5.2 Summary of Human Health Hazard

This section briefly summarizes the human health hazards of 1,2-dichloroethane. Additional information is provided in the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b).

1,2-Dichloroethane – Human Health Hazards (Section 5.2): Key Points

EPA evaluated the reasonably available information for human health hazards, including consideration of the potential for increased susceptibility across PESS factors and acute, intermediate, chronic, and lifetime exposures to 1,2-dichloroethane. The most biologically relevant and sensitive PODs for non-cancer for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding HED, the HEC, and the total combined uncertainty factors (UF) for each route and exposure duration—are summarized below. Based on the identified PODs for each exposure duration, the following HEDs and HECs were calculated to a daily, continuous exposure duration (24 h/day) in the draft risk evaluation. Additionally, HECs and the IUR from animal studies assume an individual at resting breathing rate. The lack of adequate non-cancer data by the dermal route for 1,2-dichloroethane required route-to-route extrapolation from oral PODs.

The most biologically relevant and sensitive PODs for cancer effects for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding CSF, dermal slope factor, IUR, and drinking water unit risk—are also summarized below.

Non-Cancer
The POD for the **acute** oral/dermal exposure routes is based on renal toxicity, specifically increased relative kidney weight (BMDL10 = 153mg/kg-day); the POD for the acute inhalation exposure route is based on olfactory effects, specifically nasal necrosis ($BMCL_{10}$ = 48.9 mg/m^3).

- HED = 19.9 mg/kg-day
- HEC = 2.42 ppm
- Total UF = 30 for oral, inhalation, and dermal

The POD for the **intermediate** oral/dermal exposure routes is based on renal toxicity, specifically increased relative kidney weight ($BMDL_{10}$ = 27 mg/kg-day); the POD for the intermediate inhalation exposure route is based on male reproductive effects, specifically decreased sperm concentration ($BMCL_5$ = 21.2 mg/m^3).

- HED = 6.5 mg/kg-day
- HEC = 5.2 ppm
- Total UF = 30 for oral, inhalation, and dermal

The POD for the **chronic** oral, inhalation and dermal exposure routes is based on the respective intermediate PODs with the total uncertainty factor, which includes an additional subchronic-to-chronic duration extrapolation uncertainty factor of 10× to account for the duration adjustment.

- HED = 6.5 mg/kg-day
- HEC = 5.2 ppm
- Total UF = 300 for oral, dermal, and inhalation

Cancer
The IUR is based on a combined tumor model from Nagano et al. (2006). The oral slope factor was derived by route-to-route extrapolation from the IUR of 7.1×10^{-6} per µg/m^3 from Nagano et al. (2006). Additionally, due to scarcity of data, the dermal slope factor was based on the extrapolated oral slope factor derived from Nagano et al. (2006); the drinking water unit risk is based on route-to-route extrapolation of the oral data.

- Oral/dermal cancer slope factor = 0.039 per mg/kg-day
- IUR = 7.1×10^{-6} per µg/m^3 (2.9×10^{-2} per ppm)
- Drinking Water Unit Risk = 9.8×10^{-7} per µg/L

EPA evaluated the reasonably available information for human health hazards and identified hazard PODs for adverse effects following acute, intermediate, and chronic exposures. These PODs represent the potential for greater biological susceptibility across subpopulations. The most biologically relevant and sensitive PODs for non-cancer for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding human equivalent dose (HED), the human equivalent concentration (HEC), and the total combined uncertainty factor (UF) for each route and exposure duration—are summarized below. The most biologically relevant and sensitive PODs for cancer effects for 1,2-dichloroethane from among the human health hazards identified—along with the corresponding cancer slope factor (CSF), dermal slope factor, IUR, and drinking water unit risk—are also summarized below.

EPA identified kidney toxicity, olfactory effects, and male reproductive (sperm) effects as the most sensitive critical human health hazard non-cancer outcomes associated with 1,2-dichloroethane. In this draft risk evaluation, renal toxicity forms the basis of the POD used for oral acute, intermediate, and chronic exposure scenarios. Olfactory effects are the basis of the POD used for acute inhalation exposure and male reproductive (sperm) effects are the basis for intermediate and chronic inhalation exposure scenarios. Additionally, hazard identification and evidence integration of other toxicity outcomes are also outlined to emphasize the systematic review process applied to identify potential POD within the 1,2-dichloroethane database.

EPA is proposing a POD of 153 mg/kg-day to estimate non-cancer risks from oral exposure to 1,2-dichloroethane for acute durations of exposure in this draft risk evaluation for 1,2-dichloroethane. The proposed POD was derived based on benchmark dose modeling (BMD) of increased kidney weight in male mice after a single oral gavage and is the 95 percent lower confidence limit of the BMD associated with a benchmark response (BMR) of 10 percent. The Agency has performed ¾-body weight scaling to yield the HED of 19.9 mg/kg-day and is applying the animal to human extrapolation factor (*i.e.*, interspecies extrapolation; UF_A) of 3× and a within human variability extrapolation factor (*i.e.*, intraspecies extrapolation; UF_H) of 10×. Thus, a total UF of 30× is applied for use as the benchmark margin of exposure (MOE).

EPA is proposing a POD of 48.9 mg/m^3 to estimate non-cancer risks from inhalation to 1,2-dichloroethane for acute durations of exposure in the draft risk evaluation for 1,2-dichloroethane. The proposed POD was derived based on BMD modeling of degeneration with necrosis of the olfactory (nasal) mucosa in male and female mice after an 8-hour exposure to 1,2-dichloroethane vapor and is the 95 percent lower confidence limit of the BMD associated with a BMR of 10 percent. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 9.78 mg/m^3 using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 for these nasal effects and is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (*i.e.*, UF_H) of 10×. Thus, a total UF of 30× is applied for use as the benchmark MOE.

EPA is proposing a POD of 27 mg/kg-day from a subchronic 90-day gavage study in male rats based on increased relative kidney weight to estimate non-cancer risks from oral exposure to 1,2-dichloroethane for intermediate/chronic durations of exposure in the risk evaluation of 1,2-dichloroethane. The Agency has performed ¾-body weight scaling to yield the HED of 6.5 mg/kg-day and is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (UF_H) of 10×. The use of a duration adjustment factor (*i.e.*, subchronic to long-term [chronic] duration adjustment, UF_S) of 10× was applied for the chronic duration, specifically. Thus, a total uncertainty factor (UF) of 30× is applied for use as the benchmark MOE for the intermediate duration and 300× chronic duration, respectively.

EPA is proposing a POD of 21.2 mg/m^3 to estimate non-cancer risks from inhalation to 1,2-dichloroethane for intermediate/chronic durations of exposure in the draft risk evaluation for 1,2-dichloroethane. The proposed POD was derived based on BMD modeling of decreased sperm concentration in male mice after a whole body, 4-week exposure to 1,2-dichloroethane vapor and is the 95 percent lower confidence limit of the BMD associated with a BMR of 5 percent due to a biological significance and relevance at this level in humans. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 21.2 mg/m^3, which is equal to the proposed POD by using the default regional gas dose ratio (RGDR) for the systemic (sperm) effects of 1 as the animal blood:air partition coefficient is greater than the human blood:air partition coefficient. Additionally, EPA is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (UF_H) of 10×. The use of a duration adjustment factor (UF_S) of 10× was applied for the chronic duration, specifically. Thus, a total UF of 30× is applied for use as the benchmark MOE for the intermediate duration and 300× chronic duration, respectively.

No data were available for the dermal route identified based on systematic review that were suitable for deriving route-specific PODs. Therefore, EPA used the acute, intermediate, and chronic oral PODs to evaluate risks from dermal exposure to 1,2-dichloroethane.

Systematic review identified two 1,2-dichloroethane cancer studies for cancer dose-response. The oral cancer studies in mice performed by NTP (1978) on 1,2-dichloroethane resulted in tumor types or pre-cancerous lesions (*i.e.*, hepatocellular carcinomas, endometrial polyps, hemangiosarcomas, and mammary gland tumors). This study was, however, confounded by incidences of pneumonia in the high dose groups of the study. The 1,2-dichloroethane inhalation cancer study by Nagano (2006) is the basis for the IUR based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas) in female rats and identified similar tumors as observed in the 1,2-dichloroethane oral cancer study. This study, however, did also identify incidence of mortality and pneumonia in treated mice. Due to uncertainty associated with the oral 1,2-dichloroethane study, EPA is thus proposing a CSF of 0.039 per mg/kg-day for the oral/dermal exposure routes to 1,2-dichloroethane based on based on route-to-route extrapolation from the IUR of 7.1×10^{-6} per µg/m^3 from Nagano (2006) (derived from the lower confidence limit of the BMD [BMDL] for the 95% confidence level modeled data at BMR of 10% extra risk as per U.S EPA's *Benchmark Dose Technical Guidance* (U.S. EPA, 2012a)) for both continuous (*i.e.*, general population) and worker (occupational) scenarios. In addition, EPA is proposing a drinking water (DW) unit risk of 9.8×10^{-7} per µg/L based on an extrapolation from the oral gavage data.

5.2.1 Weight of Scientific Evidence Conclusions for Human Health Hazards

EPA evaluated the confidence for human health hazard conclusions based on evidence integration conclusions, selection of the most critical endpoint and study, relevance to exposure scenarios, dose-response considerations, and incorporation of PESS. More details on how EPA evaluated these factors are provided in Section 6 of the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b).

EPA has robust overall confidence for the evidence integration, study/endpoint selection, exposure scenario applicability, dose-response, and PESS sensitivity of the conclusions and PODs for kidney toxicity, respiratory (olfactory) effects, and male reproductive (sperm) effects, which are used for the risk estimates. These hazard outcome categories received *likely* and *robust* evidence integration conclusions, and sensitive health effects were identified for these hazard outcomes. Additionally, EPA has robust overall confidence in the proposed CSF and IUR based on a combined tumor model in female rats (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas), respectively.

5.2.2 Human Health Hazard Values

Table 5-15 lists the non-cancer PODs and corresponding HECs, HEDs, and UFs that EPA used in this draft 1,2-dichloroethane risk evaluation to estimate risks following acute, intermediate, and chronic exposure, respectively. Table 5-16 provides the cancer PODs for evaluating lifetime exposure.

Table 5-15. Non-Cancer HECs and HEDs Used to Estimate Risks for 1,2-Dichloroethane

Exposure Scenario	Target Organ System	Species	Duration	POD	Effect	HEC mg/m^3 [ppm]	HED (mg/kg-day)	Benchmark MOE	Reference	Overall Quality Determination
Acute – Oral/Dermal	Renal	Mice (male)	Single dose via oral gavage	$BMDL_{10}$ = 153 mg/kg-day	Increased relative kidney weight	N/A	19.9	UF_A [a] = 3 UF_H = 10 ***Total UF = 30***	Storer et al. (1984)	High
Acute – Inhalation	Respiratory (olfactory)	Rats (males and females combined)	8-hours (whole body to vapor)	$BMCL_{10}$ = 48.9 mg/m^3 [12.1 ppm]	Degeneration with necrosis of the olfactory mucosa	9.78 mg/m^3 [2.42 ppm]	N/A	UF_A [a] = 3 UF_H = 10 ***Total UF = 30***	Dow Chemical (2006)	High
Intermediate and Chronic – Oral/Dermal	Renal	Rats (male)	90-days via oral gavage	$BMDL_{10}$ = 27 mg/kg-day	Increased relative kidney weight	N/A	6.5	*Intermediate:* UF_A [a] = 3 UF_H = 10 UF_L = 3 ***Total UF = 30*** *Chronic:* UF_A [a] = 3 UF_H = 10 UF_L = 3 UF_S = 10 ***Total UF = 300***	NTP (1991)	High
Intermediate and Chronic – Inhalation	Reproductive	Mice (male)	4-weeks (6 hours/day for 7 days/week whole body to vapor)	$BMCL_5$ = 21.2 mg/m^3 [5.2 ppm]	Decreases in sperm concentration	21.2 mg/m^3 [5.2 ppm]	N/A	*Intermediate:* UF_A [a] = 3 UF_H = 10 ***Total UF = 30*** *Chronic:* UF_A [a] = 3 UF_H = 10 UF_S = 10 ***Total UF = 300***	Zhang et al. (2017)	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 three-quarters (¾) power to derive the HED/HEC. Consistent with EPA Guidance U.S. EPA (2011b), the UF_A was reduced from 10 to 3.

Table 5-16. Cancer PODs for 1,2-Dichloroethane Lifetime Exposure Scenarios

Inhalation Unit Risk (IUR) [a]	Oral Slope Factor[b]	Dermal Slope Factor[c]	Drinking Water (DW) Unit Risk[d]	Extra Cancer Risk Benchmark	Reference	Overall Quality Determination
7.1E−06 (per $\mu g/m^3$) 2.9E−02 (per ppm)	0.039 per mg/kg/day	0.039 per mg/kg/day	9.8E–07 per µg/L	1E−06 (general population) 1E−04 (occupational)	Nagano et al. (2006)	High

[a] Cancer IUR for 1,2-dichloroethane is based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas in female rats) from Nagano et al. (2006) in female rats.
[b] Cancer slope factor (CSF) and unit risk will be derived based on continuous (general population) exposure scenarios. Due to the exposure averaging time adjustments incorporated into lifetime exposure estimates, separate cancer hazard values for worker (occupational) scenarios are not required.
[c] Oral CSF for 1,2-dichloroethane was derived from the calculated IUR from Nagano et al. (2006) and extrapolated to the dermal route to derive the corresponding dermal slope factor.
[d] The oral CSF was used to calculate a drinking water unit risk of 9.8E–07 per ug/L using a drinking water intake of 2 L/day and body weight of 80 kg.

5.3 Human Health Risk Characterization

5.3.1 Risk Characterization Approach

The exposure scenarios, populations of interest, and toxicological endpoints used for evaluating risks from acute, intermediate, and chronic/lifetime exposures are summarized in Table 5-17.

Table 5-17. Exposure Scenarios, Populations of Interest, and Hazard Values for 1,2-Dichloroethane

Population of Interest and Exposure Scenario	**Workers** Male and female adolescents and adults (≥16 years) directly working with 1,2-dichloroethane under light activity (breathing rate of 1.25 m^3/hour) (for further details see *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at)) Exposure Durations • *Acute* – 8 hours for a single work day (most OESs) • *Intermediate* – 8 hours per work day for up to 22 working days • *Chronic* – 8 hours per work day for up to 250 days per year for 31 or 40 working years Exposure Routes – Inhalation and dermal
	Occupational Non-Users Male and female adolescents and adults (≥16 years) indirectly exposed to 1,2-dichloroethane within the same work area as workers (breathing rate of 1.25 m^3/hour) (for further details see *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at)) Exposure Durations • *Acute, Intermediate, and Chronic* – Same as workers Exposure Route – Inhalation
	Consumers 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 1,2-dichloroethane through article use (for further details see *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q)) Exposure Durations • *Acute* – 1 day exposure • *Intermediate* – 30 days per year • *Chronic* – 365 days per year Exposure Routes – Inhalation, dermal, and oral
	General Population Infants, children, and adults exposed to 1,2-dichloroethane through drinking water, ambient water, ambient air, soil, and fish ingestion (for further details see *Draft General Population Exposures for 1,2-Dichloroethane* (U.S. EPA, 2025aj)) Exposure Durations • *Acute* – Exposed to 1,2-dichloroethane continuously for a 24-hour period • *Chronic* – Exposed to 1,2-dichloroethane continuously up to 78 years Exposure Routes – Inhalation, dermal, and oral (depending on exposure scenario)

Health Effects, Concentration and Time Duration	**Non-Cancer** The **acute oral/dermal**[a] endpoint is increased relative kidney weight by 13% via a single oral gavage in male mice. • HED = 19.9 mg/kg • Acute uncertainty factors (benchmark MOE) = 30 for oral and dermal (UF_A = 3; UF_H = 10) [b] The **intermediate oral/dermal**[a] endpoint is increased relative kidney weight by 18% in male rats via daily oral gavage for 90 days. • HED = 6.5 mg/kg • Intermediate uncertainty factors (benchmark MOE) = 30 for oral and dermal (UF_A = 3; UF_H = 10) [b] The **chronic oral/dermal**[a] endpoint is based on and duration adjusted from the identified intermediate POD of increased relative kidney weight seen in male rats treated with 1,2-dichloroethane via daily oral gavage for 90 days. • HED = 6.5 mg/kg • Chronic uncertainty factors (benchmark MOE) = 300 for oral and dermal (UF_A = 3; UF_H = 10; UF_S = 10) [b] The **acute inhalation endpoint** is olfactory effects– degeneration with necrosis of the olfactory mucosa. • HEC = 9.78 mg/cm^3 or 2.42 ppm • Acute uncertainty factors (benchmark MOE) = 30 for inhalation (UF_A = 3; UF_H = 10) [c] The **intermediate inhalation endpoint** is decrease in sperm concentration. • HEC = 21.2 mg/cm^3 or 5.2 ppm • Intermediate uncertainty factors (benchmark MOE) = 30 (UF_A = 3; UF_H = 10) [b] The **chronic inhalation endpoint** is decrease in sperm concentration. • HEC = 21.2 mg/cm^3 or 5.2 ppm • Chronic uncertainty factors (benchmark MOE) = 300 (UF_A = 3; UF_H = 10; UF_S = 10) [b] **Cancer** • Oral/dermal cancer slope factor [c] = 0.039 per mg/kg/day • Inhalation Unit Risk (IUR) = 7.1E−06 per $\mu g/m^3$ (2.9E−06 per ppm) • Drinking water (DW) unit risk (continuous) = 9.8E–07 per µg/L
[a] Dermal HED are extrapolated from the oral HED and are assumed to be equal. [b] Uncertainty factors in the benchmark MOE (margin of exposure): UF_A = interspecies (animal to human); UF_H = intraspecies (human variability); UF_S = subchronic-to-chronic duration adjustment [c] Oral/dermal cancer slope factor derived from the IUR.	

5.3.1.1 Estimation of Non-Cancer Risks

EPA used a margin of exposure (MOE) approach to estimate non-cancer risks. The MOE is the ratio of the non-cancer hazard value divided by a human exposure dose. Acute and chronic MOEs for non-cancer inhalation and dermal risks were calculated using Equation 5-1:

Equation 5-1.

$$MOE = (Non\text{-}cancer\ Hazard\ Value\ (POD)) \div (Human\ Exposure)$$

Where:

MOE	=	Margin of exposure for acute, intermediate, or chronic risk comparison (unitless)
$Non\text{-}cancer\ Hazard\ Value\ (POD)$	=	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 hazard value. 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, 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 if 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 discretion to consider other risk-related factors in addition to risks identified in risk characterization.*

5.3.1.2 Estimation of Cancer Risks

Extra cancer risks for repeated exposures to a chemical were estimated using Equation 5-2 or Equation 5-3:

Equation 5-2.

$$Inhalation\ Cancer\ Risk = Human\ Exposure \times IUR$$

Equation 5-3.

$$\boldsymbol{Dermal\ or\ Oral\ Cancer\ Risk = Human\ Exposure \times CSF}$$

Where:

Risk	=	Extra cancer risk (unitless)
Human Exposure	=	Exposure estimate (LADC in ppm)
IUR	=	Inhalation unit risk (risk per mg/m^3)
CSF	=	Cancer slope factor (risk per mg/kg-day)

Estimates of extra cancer risks are interpreted as the incremental probability of an individual developing cancer over a lifetime following exposure (*i.e.*, incremental or extra individual lifetime cancer risk).

5.3.2 Risk Characterization for Potentially Exposed or Susceptible Subpopulations

EPA considered PESS throughout the exposure assessment, hazard identification, and dose-response analysis. In general, the Agency evaluates several factors that may contribute to a group having increased exposure or biological susceptibility. Examples of these factors include life stage, preexisting disease, occupational and certain consumer exposures, nutrition, and lifestyle activities.

For the 1,2-dichloroethane risk evaluation, EPA accounted for the following PESS groups: workers, infants exposed to drinking water during formula bottle feeding, subsistence and Tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane. Table 5-18 summarizes how PESS were incorporated into the risk evaluation and the remaining sources of uncertainty related to consideration of PESS.

Additional information on other factors that could possibly impact greater biological susceptibility following exposure to 1,2-dichloroethane—such as more comprehensive information on preexisting diseases in humans, lifestyle activities, nutritional status, or other chemical co-exposures and non-chemical stressors—was not reasonably available.

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PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Life Stage	Life stage-specific exposure scenarios included infants exposed to drinking water during formula bottle feeding. Other scenarios of children swimming or playing in soil may be considered for dermal and oral exposure. It is unclear how relevant dermal and ingestion estimates from soil exposure are as 1,2-dichloroethane is expected to either volatilize or migrate from surface soils to groundwater. Other factors by age may be relevant.	Direct evidence of a sperm effect was the basis for the chronic inhalation POD used for risk estimation. The inhalation POD selected is considered to be protective and data were incorporated in the weight of scientific evidence. 1,2-Dichloroethane partitions in the milk of women exposed dermally in toxicokinetic considerations (ATSDR, 2024; Urusova, 1953). Children in households that smoke cigarettes, receiving secondhand smoke, may be exposed to higher levels of 1,2-dichloroethane (ATSDR, 2024; Wang et al., 2012). Smokers as well as those exposed to passive smoke may be more susceptible to lung emphysema following repeated exposure to 1,2-dichloroethane (ATSDR, 2024; Ansari et al., 1988). The increase in susceptibility due to secondhand smoke is not known and is a source of uncertainty in part reliant on proximity to the smoker, space ventilation, and frequency of smoking/number of cigarettes smoked. Evidence also from mice showed changes in sperm parameters in decreases in sperm count following short-term exposures to 1,2-dichloroethane. Potential susceptibility of older adults due to toxicokinetic differences was addressed through a 10× UF_H for human variability.
Preexisting Disease	Not applicable	Application of a 10× UF_H to account for human variability. Especially susceptible individuals, such as those with chronic kidney disease, may not be accounted for by standard approaches. The increase in susceptibility due to preexisting disease is not known and is a source of uncertainty.
Lifestyle Activities	EPA evaluated exposures resulting for subsistence and Tribal fishers and considered increased intake of fish in these populations. People that smoke cigarettes may be exposed to higher levels of 1,2-dichloroethane. Emissions from smoking cigarettes can contain between 53 and 200 µg 1,2-dichloroethane/cigarette (Wang et al., 2012).	EPA considered alcohol consumption and smoking as factors accounted for in the applied 10× UF_H for human variability. Smokers as well as those exposed to passive smoke may be more susceptible to lung emphysema following repeated exposure to 1,2-dichloroethane (ATSDR, 2024; Ansari et al., 1988). The increase in susceptibility due to secondhand smoke is not known and is a source of uncertainty in part reliant on proximity to the smoker, space ventilation, and frequency of smoking/number of cigarettes smoked.

PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Occupational Exposures	EPA considered increased exposure specific to worker activities.	Not applicable.
Sociodemographic	EPA evaluated exposure differences between groups, including women of reproductive age based on location of exposures to 1,2-dichloroethane in ambient air.	EPA utilized the most sensitive sex from rodent assays cancer modeling. EPA quantified sociodemographic differences based on sex alone.
Geography and Site-Specific	EPA assessed exposure concentrations to which residential communities proximal to releasing facilities may be exposed.	Not applicable.
Nutrition	Not applicable.	EPA did not identify nutritional factors that influence susceptibility.
Genetics/ Epigenetics	Not applicable.	Genetic variants may increase susceptibility of the target organ was addressed through a 10× UF_H for human variability. A known metabolite of 1,2-dichloroethane is the reactive 2-chloroacetaldehyde supporting that a PESS group are people with the aldehyde dehydrogenase-2 polymorphism that may have a higher risk for several diseases affecting multiple organ systems including cancer, heart disease, and osteoporosis. Individuals with genetically reduced plasma alpha-1-proteinase inhibitor and predisposed to emphysema may be at increased risk (Ansari et al., 1988). Hazard values are based on wild-type rodents and a broad occupational population and may underestimate risks for populations with sensitizing mutations.
Other Unique Activities	EPA did not identify unique activities that influence exposure.	EPA did not identify unique activities that influence susceptibility.
Aggregate Exposures	EPA assessed aggregate exposures to the general populations to the combined ambient air concentrations from several adjacent facility air releases. EPA did not aggregate routes of exposure as the endpoints are different and dependent on the corresponding route of exposure.	Not applicable.

PESS Categories	Potential Increased Exposures Incorporated into Exposure Assessment	Potential Sources of Biological Susceptibility Incorporated into Hazard Assessment
Other Chemical and Non-Chemical Stressors	EPA did not identify other chemical and non-chemical factors influencing exposure.	EPA did not identify other chemical and non-chemical stressors that influence susceptibility.

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5.3.3 Risk Estimates for Workers

This section provides relevant information on PPE reported under the 1,2-dichloroethane test order and other sources such as NIOSH Health Hazard Evaluations (HHEs), OECD ESDs and EPA GSs. Summary tables (Table 5-21 through Table 5-24) show the inhalation and dermal exposure metrics and risk estimates for workers. Risks are calculated for all exposed workers based on the 1,2-dichloroethane-derived PODs described in Section 5.2.2. Discussion and characterization of the risk estimates for workers are provided in Section 5.3.8. For additional details on the risk estimates, refer to *Risk Evaluation for 1,2-Dichloroethane – Supplemental Information File: Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025ax).

5.3.3.1 Information on Personal Protective Equipment

Under section 4(a) of TSCA, EPA issued a test order requiring manufactures and processors of 1,2-dichloroethane to develop and submit information for 1,2-dichloroethane. In response, the Vinyl Institute formed a testing consortium and provided data on occupational exposure (Stantec ChemRisk, 2024). The Vinyl Institute prepared a study plan to collect inhalation monitoring data, including identification of representative sites for sampling. The testing consortium provided inhalation monitoring information on nine sites from their members, including 5 facilities that manufacture 1,2-dichloroethane (from 16 sites), 2 facilities that process 1,2-dichloroethane, and 2 facilities that manufacture 1,2-dichlorethane as a byproduct. Sampling was conducted following EPA's review and approval of the study plan. As outlined below, the Agency does not consider the information on respiratory protection programs and engineering controls provided by the Vinyl Institute to be representative of the COU due to (1) varying levels of respirator protection associated with different tasks and across workers and facilities; and (2) the limited number of facilities within the COU that provided PPE information as these programs and controls are facility-specific. Additionally, there is a lack of regulatory standards for glove protection factors for dermal exposures (OSHA regulations do not include quantitative protection factors; see also Appendix J).

The Vinyl Institute test order report provided descriptions of the use of PPE in the identified facilities during standard, task-specific, and emergency operations, as well as PPE that was worn by workers when inhalation monitoring was performed (Stantec ChemRisk, 2024). A summary of the use of PPE information is provided below. More detailed information on each facility monitored is provided in Appendix I.

According to the test order report (Stantec ChemRisk, 2024), standard PPE was described as "PPE worn during normal operations on a full to near full-shift basis"; task-specific PPE was described as PPE "used during specific batch events, worn for the duration of the task or during specific steps in the task as specified in the company-specific SOP"; and emergency PPE was described as PPE "used only in the event of an upset condition (*e.g.*, spill, leak, accidental release)." According to the Vinyl Institute test order report, each representative facility utilized similar standard PPE, task-specific PPE, and emergency-use PPE. The test order report noted that the PPE type used was dependent on the process area and task performed as well as specifications in company-specific SOPs (details of which were not provided). For example, maintenance technicians were described as wearing additional PPE for specific maintenance tasks as necessary, and laboratory technicians were also described as wearing additional PPE when disposing of laboratory waste. Tables 12 to 14 of the test order report provide a summary of different types of PPE used in production process, logistics work, and laboratory work areas.

Routine tasks conducted by ONUs (*e.g.*, office work) did not require access to process areas with exposure potential, and thus no PPE was required for these workers however, ONUs were described as wearing standard process area PPE when conducting process walkthroughs or other tasks that required them to enter process areas.

Respiratory Protection

According to the test order report, operators, maintenance, logistics, and laboratory personnel utilized different respiratory protection depending on the task performed and the type of chemical exposure associated with each task. Respiratory protection was not included as standard PPE in any work areas (production process, logistics, and laboratory) (see Tables 12–14 of the test order report; (Stantec ChemRisk, 2024). A summary of task-based PPE is provided below.

Operators were described as wearing half- or full-face, air-purifying respirators during sample collection tasks (open or closed loop). This corresponds to an assigned protection factor (APF) 10 or 50 when the employer implements a continuing, effective respiratory protection program under the OSHA Respiratory Protection Standard.[12] Additionally, operators were described as wearing full-face respirators of varying types (APF 50–1,000) during other tasks with exposure potential such as process leak response, maintenance preparation activities, and filling totes.

Logistics technicians were described as wearing half- or full-face respirators (APF 10 or 50) during loading or offloading tasks, which required connecting and disconnecting process lines to railcars, barges, and trucks.

Maintenance technicians were described as wearing full-face airline respirators (APF 1,000) during major maintenance tasks (*e.g.*, line breaks and other equipment openings).

Laboratory technicians were described as wearing half-face respirator (APF 10) with organic vapor cartridges (when standards are weighed on benchtop). Certain laboratory personnel were described as wearing full-face air-purifying respirators (APF 1,000) during disposal of hazardous wastes from fume hoods.

ONUs were "primarily" not reported to wear respiratory protection during routine daily tasks, although one supervisor was described as wearing a full-face respirator (APF 50) while observing loading activities from 20 feet away.

Additionally, the test order report provided information on respirator use during STEL (short-term exposure limit) sample collection (Stantec ChemRisk, 2024). It was reported that in facilities that manufacture 1,2-dichloroethane, a lack of respiratory protection was noted for 16 percent of the STEL samples that were greater than the NIOSH REL-STEL (n = 7) and no information on respiratory protection use (or lack of use) was reported for 5 percent of the STEL samples (n = 2). Based on the test report, respiratory protection was not worn by some operators with full-shift exposures above the NIOSH REL.

Dermal Protection

According to the test order report, generally, within the production process areas, standard dermal PPE worn included neoprene, leather, or cut-resistant gloves and task-specific PPE included nitrile or viton/butyl gloves (Stantec ChemRisk, 2024). Similarly, in logistics work areas, standard dermal PPE included neoprene gloves and task specific PPE included heavy-duty nitrile gloves and eye protection.

[12] https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134 (accessed November 10, 2025).

In the laboratory areas, standard PPE included nitrile gloves. There was no documentation on glove changeout, efficacy, or what was worn relative to each specific task.

Information on PPE from Other Sources

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, provide respirators that are applicable and suitable for the purpose intended. Respirator selection provisions are provided in 1910.134(d) and require that appropriate respirators are selected based on the respiratory hazard(s) to which the worker will be exposed and workplace and user factors that affect respirator performance and reliability. Assigned APFs are provided in Table 1 under 1910.134(d)(3)(i)(A) (see also Table 5-19 below) 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 continuing, effective respiratory protection program according to the requirements of OSHA's Respiratory Protection Standard. OSHA has not established protection factors for gloves.

Table 5-19. 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)					

EPA also gathered information on PPE applicable to the OESs assessed in this draft risk evaluation that was available in other sources such as EPA-developed GSs and OECD ESDs and NIOSH HHEs. This information is summarized below in Table 5-20. Additional information developed by the European Centre for Ecotoxicology and Toxicology of Chemicals is provided in Appendix J.

3009 **Table 5-20. Other Information on PPE for OES Not Covered in Test Order**

OES	PPE Information
Repackaging	The Chemical Repackaging GS indicated that limited information was found regarding typical PPE workers used during repackaging processes. One chemical wholesaler website indicated that commonly used PPE includes safety glasses, face shields, aprons, and gloves, while engineering controls at another site include vacuum system and centrifugal degassing (U.S. EPA, 2022a).
Processing into formulation, mixture, or reaction product	The ESD on Adhesive Formulation indicated that no information on typical PPE specific to adhesive formulation was found. Chemical submissions submitted to EPA by adhesive chemical manufacturers showed that, at a minimum, all manufacturers recommended the use of gloves and safety glasses with side shields or goggles. Approximately half of the submissions also recommended the use of some kind of ventilation and respirators if necessary. One submission for a hot-melt adhesive chemical also specifically recommended the use of thermal gloves (OECD, 2009a). EPA also received worker protection information, including on the use of chemical-resistant gloves, safety glasses, Tyvek jackets, and engineering controls, from the U.S. Department of Energy related to activities associated with this COU (DOE, 2025).
Distribution in commerce	None found.
Industrial application of adhesives and sealants	The ESD on the Use of Adhesives indicated that the flexible packaging manufacturing industry utilizes the following PPE: chemical-resistant gloves and safety glasses (OECD, 2015). A NIOSH HHE for a coating facility (using TCE) indicates that PPE included single cartridge NIOSH-approved respirators during the mixing and spraying of coatings. The spray painters also used a paper helmet and goggles during paint mixing or applying coatings. The HHE noted that while the painters wore respirators, the foreman did not (Chrostek, 1981).
Industrial application of lubricants and greases	None found.
Commercial aerosol products	None found.
Non-aerosol cleaning and degreasing	The ESD on the Use of Vapor Degreasers summarized a monitoring study of worker exposure at 5 vapour degreasing facilities across several industries. Only 1 of 5 facilities studied indicated that respiratory protection was used. At this facility, 1 worker (out of 31) effectively used the respirator for less than 15–20 minutes for the entire work shift. Two other workers at the facility briefly wore air-purifying respirator but did not wear it properly and failed quantitative fit testing. Respirators were not used by other employees or in other facilities. The study also reported that only few workers occasionally wore gloves, and those who wore gloves did not choose the proper glove material for the vapor degreasing chemical (OECD, 2021). NIOSH HHEs for various vapor degreasing facilities (using TCE) were varied, some mentioning glove and respirator use. When gloves and respirators were not use, the NIOSH report typically included them in their recommendations (Seitz and Driscoll, 1989; Daniels et al., 1988; NIOSH, 1984; Lewis, 1980; NIOSH, 1973).

OES	PPE Information
Laboratory use	Use of Laboratory Chemicals GS indicated that the Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450) requires that laboratories have a written Chemical Hygiene Plan (CHP) (OSHA, 2011). The CHP must include criteria for the use of PPE and engineering controls. Examples of PPE include respirators, face shields, goggles, and disposable gloves. OSHA requires the use of eye or face protection where there is potential exposure from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. Hand protection, such as gloves, is required when hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes. Respiratory protection is required if necessary to protect the health of individuals (U.S. EPA, 2023d).
Waste handling, treatment, and disposal	None found.

5.3.3.1.1 Uncertainties with the PPE Use and Protection Factors

Respirator APFs have technical significance but are generic values based on assumed workplace conditions, and usage of a specific respirator type does not guarantee achieving the generic APF during all use scenarios. Nevertheless, respirator APFs are based on specific conditions and approved by NIOSH in conjunction with OSHA regulations. Glove protection factors are more subjective than APFs applied to respirators due to the lack of regulatory standards aligning them with actual work practices. Again, OSHA does not have a comparable protection factor designation for dermal exposures.

The test order summary report describes dermal and respiratory PPE used in the facility. EPA's practice is to consider if the PPE used at the facility as described in the test order summary report provides protection consistent with the Agency's assessment of the PPE protection factor needed for acceptable MOEs. Based on the available information in the test order report, workers do not wear respiratory protection as standard PPE for full or near full-shift durations; however, respirators are used during specific tasks. As previously described, varying levels of respirator protection are associated with tasks described in the test order, and use of PPE varied across workers and facilities. For example, some operators at Site A who collected samples and connected/disconnected hoses were noted as not wearing respiratory protection, while some operators at Site D were described as wearing full-face respirators during sample collection tasks. Given the variation in tasks and reported respirator use associated with specific tasks, it is difficult to assume a consistent level of respiratory protection across a job group. However, it should be noted that the proper use of respiratory protection during high-exposure tasks will reduce the overall full-shift exposure. If these high-exposure tasks contribute a large percentage of potential exposure during a shift, then the proper use of PPE may significantly reduce full-shift exposures.

During EPA's review and approval of the test order sampling plan, the inclusion of information on respiratory protection programs and engineering controls was a key consideration. The Vinyl Institute Consortium indicated limitations in the level of detail they could provide due to confidentiality concerns. A summary of the PPE and engineering controls information collected during the inhalation monitoring is provided above. More detail information on each facility monitored is provided in Appendix I. The Vinyl Institute's proposal included monitoring at least one facility from each company. Although the EPA-approved test order sampling plan is representative of the COU for the inhalation monitoring data, the Agency has less certainty in the representativeness of PPE use and engineering controls. EPA welcomes additional information to inform the use of PPE and will consider all information received during the public comment period.

5.3.3.2 Inhalation and Dermal Exposure Metrics and Risks

This section provides summary tables for inhalation and dermal metrics and risks. The *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at) provides more detail on the estimation of the inhalation and dermal exposure metrics. For non-cancer effects, the 1,2-dichloroethane specific HEC (inhalation) or HED (dermal) values (Section 5.2.2) were divided by the value of the inhalation or dermal exposure metric for the effect to determine the MOE. This was then compared to the benchmark value to assess risks. For 1,2-dichloroethane-specific cancer effects, the IUR (inhalation) or CSF (dermal) values (Section 5.2.2) were multiplied by the value of the inhalation or dermal exposure metric to estimate the chronic cancer exposure estimates. These values were then compared to the benchmark values to assess risk.

Table 5-21 provides the occupational inhalation exposure metrics. Table 5-22 provides occupational inhalation MOEs with and without PPE, as well as the minimum APF needed (depending on the expected workplace activity, represented in the draft risk evaluation by the various SEGs) for an MOE above the non-cancer benchmark or below the cancer benchmark, for the OES and worker categories assessed for 1,2-dichloroethane. It should be noted that in addition to the use of respirators that achieve a minimum APF, these benchmarks may be met by implementation of other exposure controls (*e.g.*, engineering controls) that may be equally or more effective in reducing worker exposure. Table 5-23 provides the occupational dermal exposure metrics. Table 5-24 provides occupational dermal MOEs for the OES and worker categories assessed for 1,2-dichloroethane.

Table 5-21. Summary of Occupational Inhalation Exposure Metrics

COU			OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures	
Life Cycle Stage	Category	Subcategory			8-Hour TWA (ppm)		$AC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)	
					CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	Operators	0.48	7.3	0.33	5.0	0.24	3.6	0.22	3.4	8.9E−02	1.7
				Logistics technicians	1.7E−02	0.24	1.2E−02	0.16	8.5E−03	0.12	7.9E−03	0.11	3.1E−03	5.7E−02
				Maintenance technicians	4.9E−02	1.60	3.3E−02	1.1	2.4E−02	0.80	2.3E−02	0.75	9.1E−03	0.38
				Laboratory technicians	4.7E−02	1.30	3.2E−02	0.88	2.2E−02	0.65	2.2E−02	0.61	8.7E−03	0.31
				ONU[a]	1.4E−02	1.6	9.5E−03	1.1	7.0E−03	0.80	6.5E−03	0.75	2.6E−03	0.38
			Manufacturing as an unintended byproduct	Operators	7.4E−02	0.27	5.0E−02	0.18	3.7E−02	0.13	3.4E−02	0.13	1.4E−02	6.5E−02
				Logistics technicians	6.5E−02	1.70	4.4E−02	1.2	3.2E−02	0.85	3.0E−02	0.79	1.2E−02	0.41
				Maintenance technicians	2.1E−02	0.36	1.4E−02	0.24	1.0E−02	0.18	9.8E−03	0.17	3.9E−03	8.6E−02
				Laboratory technicians	2.6E−02	7.6E−02	1.8E−02	5.2E−02	1.3E−02	3.8E−02	1.2E−02	3.5E−02	4.8E−03	1.8E−02
				ONU[a]	4.9E−03	0.16	3.3E−03	0.11	2.4E−03	8.0E−02	2.3E−03	7.5E−02	9.1E−04	3.8E−02
Manufacturing	Import	Import	Repackaging	Worker	35	45	24	31	17	22	16	21	6.5	11
Processing	Repackaging	Repackaging		ONU	35	35	24	24	17	17	16	16	6.5	8.4
Manufacturing	Import	Import	Repackaging (modeled)	Worker	4.9	18	3.4	12	2.5	9.1	0.22	4.1	8.8E−02	2.1
Processing	Repackaging	Repackaging		ONU	4.9	4.9	3.4	3.4	2.5	2.5	0.22	1.1	8.8E−02	0.56
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	Operators	1.3E−03	4.8E−03	8.8E−04	3.3E−03	6.5E−04	2.4E−03	6.1E−04	2.2E−03	2.4E−04	1.1E−03
Processing	Recycling	Recycling		Logistics technicians	0.17	2.3	0.12	1.6	8.5E−02	1.1	7.9E−04	1.1	3.1E−02	0.55
				Maintenance technicians	3.2E−04	2.1E−03	2.2E−04	1.4E−03	1.6E−04	1.0E−03	1.5E−04	9.8E−04	5.9E−05	5.0E−04
Industrial Use	Process regulator	*e.g.*, Catalyst moderator; Oxidation inhibitor		Laboratory technicians	6.9E−04	1.5E−03	4.7E−04	1.0E−03	3.4E−04	7.5E−04	3.2E−04	7.0E−04	1.3E−04	3.6E−04
				ONU[a]	2.1E−04	2.6E−04	1.4E−04	1.8E−04	1.0E−04	1.3E−04	9.8E−05	1.2E−04	3.9E−05	6.2E−05

COU			OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures	
Life Cycle Stage	**Category**	**Subcategory**			**8-Hour TWA (ppm)**		**$AC_{8\text{-hr TWA}}$ (ppm)**		**$ADC_{8\text{-hr TWA}}$ (ppm)**		**$ADC_{8\text{-hr TWA}}$ (ppm)**		**$LADC_{8\text{-hr TWA}}$ (ppm)**	
					CT	**HE**	**CT**	**HE**	**CT**	**HE**	**CT**	**HE**	**CT**	**HE**
Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	Worker	0.19	1.4	0.13	0.98	9.5E−02	0.72	8.9E−02	0.67	3.5E−02	0.34
		Processing aids: specific to petroleum production		ONU	0.19	0.23	0.13	0.16	9.5E−02	0.11	8.9E−02	0.11	3.5E−02	5.5E−02
		Adhesives and sealants; Lubricants and greases; Process regulators; Degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing												
Industrial Use	Other use	Process solvent												
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	Worker	4.6	40	3.1	27	2.3	20	2.1	18	0.85	9.4
				ONU	0.90	1.0	0.61	0.68	0.45	0.50	0.42	0.47	0.17	0.24
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	Worker	3.5	9.0	2.4	6.1	1.7	4.5	1.6	4.2	0.64	2.1
				ONU	2.3	7.4	1.6	5.0	1.2	3.7	1.1	3.5	0.43	1.8
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and commercial non-aerosol cleaning/ degreasing	Worker	14	78	9.4	53	6.9	39	6.4	36	2.6	19
				ONU	1.1	9.1	0.75	6.2	0.55	4.5	0.51	4.2	0.20	2.2
			Commercial aerosol products (aerosol degreasing, aerosol lubricants)	Worker	46	112	31	76	23	56	21	52	8.4	27
				ONU	30	93	21	63	15	46	14	43	5.6	22

COU			OES	Category	8-Hour TWA Exposures		Acute, Non-Cancer Exposures		Intermediate, Non-Cancer Exposures		Chronic, Non-Cancer Exposures		Chronic, Cancer Exposures	
Life Cycle Stage	Category	Subcategory			8-Hour TWA (ppm)		$AC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$ADC_{8\text{-hr TWA}}$ (ppm)		$LADC_{8\text{-hr TWA}}$ (ppm)	
					CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Commercial Use	Other use	Laboratory chemical	Laboratory use	Worker	4.7E−02	1.3	3.2E−02	0.88	2.3E−02	0.65	2.2E−02	0.61	8.7E−03	0.31
				ONU	4.7E−02		3.2E−02	3.2E−02	2.3E−02	2.3E−02	2.2E−02	2.2E−02	8.7E−03	1.1E−02
Disposal	Disposal	Disposal	Waste handling, treatment and disposal (landfill)	Worker	7.8E−04	7.8E−04	5.3E−04	1.9E−03	3.9E−04	1.4E−03	3.6E−04	1.3E−03	1.4E−04	6.6E−04
				ONU	8.9E−02	0.24	5.3E−04	5.3E−04	3.9E−04	3.9E−04	3.6E−04	3.6E−04	1.4E−04	1.9E−04
			Waste handling, treatment and disposal (POTW, non-POTW, WWT)	Worker	8.9E−02	0.24	6.0E−02	0.16	4.4E−02	0.12	4.1E−02	0.11	1.6E−02	5.6E−02
				ONU	8.9E−02	8.9E−02	6.0E−02	6.0E−02	4.4E−02	4.4E−02	4.1E−02	4.1E−02	1.6E−02	2.1E−02

CT = central tendency; HE = high-end; ONU = occupational non-user; POTW = publicly owned treatment works; TWA = time-weighted average; WWT = wastewater treatment
[a] The high-end from the closed system ONU monitoring data is considered to be a representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group.

Table 5-22. Occupational Inhalation Risk Summary Table

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	Category	Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	Operator [c]	CT	**7.4**	74 (APF 10)	**22**	217 (APF 10)	**23**	581 (APF 25)	**2.6E–03**	5.2 E–05 (APF 50)
					HE	**0.49**	487 (APF 1,000)	**1.4**	36 (APF 25)	**1.5**	1,529 (APF 1,000)	**5.1E–02**	5.1E–05 (APF 1,000)
				Logistics technician [d]	CT	209	–	613	–	656	–	9.1E–05	–
					HE	**15**	148 (APF 10)	43	–	**47**	465 APF 10)	**1.7E–03**	6.7E–05 (APF 25)
				Maintenance technician [e]	CT	73	–	213	–	**228**	2,278 (APF 10)	**2.6E–04**	2.6E–05 (APF 10)
					HE	**2.2**	56 (APF 25)	**6.5**	65 (APF 10)	**7.0**	349 (APF 50)	**1.1E–02**	1.1E–05 (APF 1,000)
				Laboratory technician [f]	CT	76	–	222	–	**237**	2,375 (APF 10)	**2.5E–04**	2.5E–05 (APF 10)
					HE	**2.7**	68 (APF 25)	**8.0**	80 (APF 10)	**8.6**	429 (APF 50)	**9.0E–03**	9.0E–06 (APF 1,000)
				ONU [g] [h]	CT	254	–	745	–	797	–	7.5E–05	–
					HE	**2.2**	56 (APF 56)	**6.5**	65 (APF 10)	**7.0**	349 (APF 50)	**1.1E–02**	1.1E–05 (APF 1,000)

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	Category	Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing – as an unintended byproduct	Operator [c]	CT	48	–	141	–	**151**	1,508 (APF 10)	**4.0E−04**	4.0E−05 (APF 10)
					HE	**13**	132 (APF 10)	39	–	**41**	413 (APF 10)	**1.9E−03**	7.5E−05 (APF 25)
				Logistics technician [d]	CT	55	–	160	–	**172**	1,717 (APF 10)	**3.5E−04**	3.5E−05 (APF 10)
					HE	**2.1**	52 (APF 25)	**6.1**	61 (APF 10)	**6.6**	328 (APF 50)	**1.2E−02**	1.2E−05 (APF 1,000)
				Maintenance technician [e]	CT	169	–	496	–	531	–	**1.1E−04**	1.1E−05 (APF 10)
					HE	**9.9**	99 (APF 10)	**29**	290 (APF 10)	**31**	310 (APF 10)	**2.5E−03**	1.0E−06 (APF 25)
				Laboratory technician [f]	CT	137	–	401	–	429	–	**1.4E−04**	1.4E−05 (APF 10)
					HE	47	–	137	–	**147**	1,468 (APF 10)	**5.3E−04**	5.3E−05 (APF 10)
				ONU [g h]	CT	726	–	2,127	–	2,278	–	2.6E−05	–
					HE	**22**	222 (APF 10)	65	–	**70**	698 (APF 10)	**1.1E−03**	4.4E−05 (APF 25)
Manufacturing	Import	Import	Repackaging (PBZ)	Worker	CT	**0.10**	102 (APF 1,000)	**0.30**	298 (APF 1,000)	**0.32**	319 (APF 1,000)	**0.19**	1.9E−05 (APF 10,000)
Processing	Repackaging	Repackaging			HE	**7.9E−02**	79 (APF 1,000)	**0.23**	232 (APF 1,000)	**0.25**	2,480 (APF 10,000)	**0.31**	3.1E−05 (APF 10,000)
				ONU	CT	**0.10** [i]	102 (APF 1,000)	**0.30** [i]	298 (APF 1,000)	**0.32** [j]	319 (APF 1,000)	**0.19**	1.9E−05 (APF 10,000)
					HE						319 (APF 1,000)	**0.24**	2.4E−05 (APF 10,000)

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	**Category**	**Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**
Manufacturing	Import	Import	Repackaging (modeled)	Worker	CT	**0.72**	36 (APF 50)	**2.1**	53 (APF 25)	**24**	590 (APF 25)	**2.5E−03**	5.1E−05 (APF 50)
				Worker	HE	**0.19**	194 (APF 1,000)	**0.57**	570 (APF 1,000)	**1.3**	1,281 (APF 1,000)	**6.0E−02**	6.0E−05 (APF 1,000)
Processing	Repackaging	Repackaging		ONU	CT	**0.72** [i]	**36 (APF 50)**	**2.1** [i]	**53 (APF 50)**	**24**	**590 (APF 50)**	**2.5E−03**	5.1E−05 (APF 50)
				ONU	HE		**36 (APF 50)**		**53 (APF 50)**	**4.8**	**4,756**	**1.6E−02**	1.6E−05 (APF 1,000)
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	Operator [c]	CT	2,736	–	8,018	–	8,585	–	7.0E−06	–
				Operator [c]	HE	741	–	2,172	–	2,325	–	3.3E−05	–
				Logistics technician [d]	CT	**21**	209 (APF 10)	61	–	**66**	656 (APF 10)	**9.1E−04**	9.1E−05 (APF 10)
				Logistics technician [d]	HE	**1.5**	39 (APF 25)	**4.5**	45 (APF 10)	**4.9**	4,852 (APF 1,000)	**1.6E−02**	1.6E−05 (APF 1,000)
				Maintenance technician [e]	CT	1.1E04	–	3.3E04	–	3.5E04	–	1.7E−06	–
				Maintenance technician [e]	HE	1,694	–	4,964	–	5,314	–	1.5E−05	–
				Laboratory technician [f]	CT	5,156	–	1.5E04	–	1.6E04	–	3.7E−06	–
Processing	Recycling	Recycling		Laboratory technician [f]	HE	2,372	–	6,949	–	7,440	–	1.0E−05	–
Industrial Use	Process regulator	*e.g.*, Catalyst moderator; Oxidation inhibitor		Worker – herbicide manufacture	CT	**19**	187 (APF 10)	55	–	**59**	587 (APF 10)	**1.0E−03**	4.1E−05 (APF 25)
				Worker – herbicide manufacture	HE	**2.5**	62 (APF 25)	**7.2**	72 (APF 10)	**7.8**	388 (APF 50)	**1.0E−02**	1.0E−05 (APF 1,000)
				ONU [g]	CT	1.7E04	–	5.0E04	–	5.3E04	–	1.1E−06	–
				ONU [g]	HE	1.4E04	–	4.0E04	–	4.3E04	–	1.8E−06	–

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	Category	Subcategory				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing Processing aids: specific to petroleum production	Processing into formulation, mixture, or reaction product	Worker	CT	**19**	187 (APF 10)	55	–	**59**	587 (APF 10)	**1.0E−03**	4.1E−05 (APF 25)
		Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing			HE	**2.5**	62 (APF 25)	**7.2**	72 (APF 10)	**7.8**	388 (APF 50)	**1.0E−02**	1.0E−05 (APF 1,000)
				ONU	CT	**19**	187 (APF 10)	55	–	**59**	587 (APF 10)	**1.0E−03**	4.1E−05 (APF 25)
Industrial Use	Other use	Process solvent			HE	**15**	155 (APF 10)	45	–	**49**	485 (APF 10)	**1.6E−03**	6.4E−05 (APF 25)
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	Worker	CT	**0.77**	39 (APF 50)	**2.3**	57 (APF 25)	**2.4**	2,426 (APF 1,000)	**2.5E−02**	2.5E−05 (APF 1,000)
					HE	**9.0E−02**	90 (APF 1,000)	**0.26**	264 (APF 1,000)	**0.28**	2,825 (APF 10,000)	**0.27**	2.7E−05 (APF 10,000)
				ONU	CT	**4.0**	40 (APF 10)	**12**	116 (APF 10)	**12**	310 (APF 25)	**4.8E−03**	9.7E−05 (APF 50)
					HE	**3.6**	36 (APF 10)	**10**	104 (APF 10)	**11**	558 (APF 50)	**6.9E−03**	6.9E−06 (APF 1,000)

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	**Category**	**Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	Worker	CT	**1.0**	51 (APF 50)	**3.0**	30 (APF 10)	**3.2**	3,222 (APF 1,000)	**1.9E−02**	1.9E−05 (APF 1,000)
					HE	**0.40**	397 (APF 1,000)	**1.2**	58 (APF 50)	**1.2**	58 (APF 50)	**6.2E−02**	6.2E−05 (APF 1,000)
				ONU	CT	**1.5**	38 (APF 25)	**4.5**	45 (APF 10)	**4.8**	4,830 (APF 1,000)	**1.2E−02**	1.2E−05 (APF 1,000)
					HE	**0.48**	479 (APF 1,000)	**1.4**	35 (APF 25)	**1.5**	1,000 (APF 1,000)	**5.1E−02**	5.1E−05 (APF 1,000)
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and commercial non-aerosol cleaning/ degreasing	Worker	CT	**0.26**	258 (APF 1,000)	**0.76**	38 (APF 50)	**0.81**	809 (APF 1,000)	**7.4E−02**	7.4E−05 (APF 1,000)
					HE	**4.6E−02**	46 (APF 1,000)	**0.13**	134 (APF 1,000)	**0.14**	1,434 (APF 10,000)	**0.54**	5.4E−05 (APF 10,000)
				ONU	CT	**3.2**	32 (APF 10)	**9.5**	95 (APF 10)	**10**	507 (APF 50)	**5.9E−03**	5.9E−06 (APF 1,000)
					HE	**0.39**	391 (APF 1,000)	**1.1**	57 (APF 50)	**1.2**	1,226 (APF 1,000)	**6.3E−02**	6.3E−05 (APF 1,000)
			Commercial aerosol products (aerosol degreasing, aerosol lubricants)	Worker	CT	**7.8E−02**	78 (APF 1,000)	**0.23**	229 (APF 1,000)	**0.25**	2,451 (APF 10,000)	**0.24**	2.5E−05 (APF 10,000)
					HE	**3.2E−02**	32 (APF 1,000)	**9.3E−02**	93 (APF 1,000)	**9.9E−02**	994 (APF 10,000)	**0.78**	7.8E−05 (APF 10,000)
				ONU	CT	**0.12**	118 (APF 1,000)	**0.34**	344 (APF 1,000)	**0.37**	369 (APF 1,000)	**0.16**	1.6E−05 (APF 10,000)
					HE	**3.8E−02**	38 (APF 1,000)	**0.11**	112 (APF 1,000)	**0.12**	1,201 (APF 10,000)	**0.64**	6.4E−05 (APF 10,000)

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	**Category**	**Subcategory**				**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**	**MOE – No PPE [a]**	**MOE – APF [b]**
Commercial Use	Other use	Laboratory chemical	Laboratory use	Worker	CT	76	–	222	–	**237**	2,375 (APF 10)	**2.5E−04**	2.5E−05 (APF 10)
					HE	**2.7**	68 (APF 25)	**8.0**	80 (APF 10)	**8.6**	429 (APF 50)	**9.0E−03**	9.0E−06 (APF 1,000)
				Worker – herbicide manufacture	CT	32	–	95	–	**101**	1,015 (APF 10)	**5.9E−04**	5.9E−05 (APF 10)
					HE	**30**	296 (APF 10)	87	–	**93**	930 (APF 10)	**8.3E−04**	8.2E−05 (APF 10)
				ONU	CT	76 [i]	–	222 [i]	–	**237 [j]**	2,375 (APF 10)	**2.5E−04**	2.5E−05 (APF 10)
					HE		–		–		2,375 (APF 10)	**3.3E−04**	3.3E−05 (APF 10)
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)	Worker	CT	4,571	–	1.3E04	–	1.4E04	–	4.2E−06	–
					HE	1,280	–	3,750	–	4,015	–	1.9E−05	–
				ONU	CT	4,571 [i]	–	1.3E04 [i]	–	1.4E04 [j]	–	4.2E−06	–
					HE		–		–		–	5.4E−06	–
			Waste handling, treatment, and disposal (POTW and non-POTW WWT)	Worker	CT	40	–	118	–	**126**	1,260 (APF 10)	**4.8E−04**	4.8E−05 (APF 10)
					HE	**15**	151 (APF 10)	44	–	**47**	473 (APF 10)	**1.6E−03**	6.6E−05 (APF 25)
				ONU	CT	40 [i]	–	118 [i]	–	**126 [j]**	–	**6.1E−04**	6.1E−05 (APF 10)
					HE		–		–		–	**4.8E−04**	4.8E−05 (APF 10)

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)		Intermediate Non-Cancer (Benchmark MOE = 30)		Chronic Non-Cancer (Benchmark MOE = 300		Chronic Cancer (Benchmark MOE = 1E−04)	
Life Cycle Stage	**Category**	**Subcategory**				**MOE – No PPE** [a]	**MOE – APF** [b]	**MOE – No PPE** [a]	**MOE – APF** [b]	**MOE – No PPE** [a]	**MOE – APF** [b]	**MOE – No PPE** [a]	**MOE – APF** [b]

APF = assigned protection factor; CT = central tendency; HE = high-end; MOE = margin of exposure; PPE = personal protective equipment
"–" = inhalation APF not needed
[a] Risk estimates that exceed the benchmark (*i.e.*, non-cancer risks less than the risk benchmark and cancer risks exceeding the cancer risk benchmark) are bolded and shaded.
[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.
[c] Test order data showed that operators wore respirators with APFs ranging from 10–1,000 while performing various tasks.
[d] Test order data showed that logistics technicians wore respirators with APFs ranging from 10–50 during loading or offloading tasks.
[e] Test order data showed that maintenance technicians wore full-face airline respirators of APF 1,000 during major maintenance tasks.
[f] Test order data showed that laboratory technicians wore respirators with APFs ranging from 10–1,000 while performing various tasks.
[g] The high-end from the closed system ONU monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group.
[h] Test order data showed ONUs were not reported to wear respiratory protection during routine daily tasks, although 1 supervisor was noted to wear a full-face respirator (APF 50) while observing loading activities from 20 feet away.
[i] Where EPA was not able to estimate ONU inhalation exposure from monitoring data or models, ONU inhalation exposures were assumed to be equivalent to the central tendency experienced by workers for the corresponding OES.
[j] High-end and central tendency exposure days are the same for Processing (repackaging), Commercial laboratory use, and Waste handling, treatment, and disposal (250 days/yr); therefore, chronic non-cancer exposure estimates are the same.

Table 5-23. Summary of Occupational Dermal Exposure Metrics

COU: Life Cycle Stage	COU: Category	COU: Subcategory	OES	Category	Estimation Method	Acute Potential Dose Rate APDR (mg/day) CT	Acute Potential Dose Rate APDR (mg/day) HE	Acute Retained Dose ARD (mg/kg-day) CT	Acute Retained Dose ARD (mg/kg-day) HE	Intermediate Retained Dose, Non-Cancer IRD (mg/kg-day) CT	Intermediate Retained Dose, Non-Cancer IRD (mg/kg-day) HE	Chronic Retained Dose, Non-Cancer CRD (mg/kg-day) CT	Chronic Retained Dose, Non-Cancer CRD (mg/kg-day) HE	Chronic Retained Dose, Cancer LCRD (mg/kg-day) CT	Chronic Retained Dose, Cancer LCRD (mg/kg-day) HE
Manu-facturing	Domestic manufacture	Domestic manufacture	Manufacturing	Operator	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Logistic technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Maintenance technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Laboratory technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
			Manufacturing as an unintended byproduct	Operator	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Logistics technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Maintenance technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Laboratory technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
Manu-facturing	Import	Import	Repackaging	Worker	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.6E−02	4.5E−02	9.6E−03	1.9E−02
Processing	Repackaging	Repackaging													
Processing	Processing – as a reactant	Intermed. in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant	Operator	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Logistics technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
				Maintenance technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	NE [a]	1.0E−02	NE [a]
Processing	Recycling	Recycling		Laboratory technician	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	4.7E−02	1.0E−02	2.0E−02
Industrial Use	Process regulator	*e.g.*, Catalyst moderator; oxidation inhibitor		Worker – herbicide manufacture	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	4.7E−02	1.0E−02	2.0E−02

COU			OES	Category	Estimation Method	Acute Potential Dose Rate APDR (mg/day)		Acute Retained Dose ARD (mg/kg-day)		Intermediate Retained Dose, Non-Cancer IRD (mg/kg-day)		Chronic Retained Dose, Non-Cancer CRD (mg/kg-day)		Chronic Retained Dose, Cancer LCRD (mg/kg-day)	
Life Cycle Stage	**Category**	**Subcategory**				**CT**	**HE**	**CT**	**HE**	**CT**	**HE**	**CT**	**HE**	**CT**	**HE**
Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing	Processing into formulation, mixture, or reaction product	Worker	Probabilistic	3.2	5.5	4.1E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	4.7E−02	1.0E−02	2.0E−02
		Processing aids: specific to petroleum production													
		Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing													
	Other use	Process solvent													
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	Worker	Probabilistic	3.0	5.1	3.7E−02	6.4E−02	2.7E−02	4.7E−02	1.8E−02	3.6E−02	6.8E−03	1.5E−02
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	Worker	Probabilistic	0.24	0.45	3.0E−03	5.6E−03	2.2E−03	4.1E−03	2.0E−03	3.8E−02	7.6E−04	1.6E−03

COU			OES	Category	Estimation Method	Acute Potential Dose Rate APDR (mg/day)		Acute Retained Dose ARD (mg/kg-day)		Intermediate Retained Dose, Non-Cancer IRD (mg/kg-day)		Chronic Retained Dose, Non-Cancer CRD (mg/kg-day)		Chronic Retained Dose, Cancer LCRD (mg/kg-day)	
Life Cycle Stage	Category	Subcategory				CT	HE	CT	HE	CT	HE	CT	HE	CT	HE
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and commercial non-aerosol cleaning/degreasing	Worker	Probabilistic	3.2	5.5	4.0E−02	6.9E−02	3.0E−02	5.1E−02	2.8E−02	4.7E−02	1.0E−02	2.0E−02
			Commercial aerosol products (aerosol degreasing, aerosol lubricants)	Worker	Probabilistic	3.1	5.3	3.8E−02	6.6E−02	2.8E−02	4.8E−02	2.6E−02	4.5E−02	9.9E−03	1.9E−02
Commercial Use	Other use	Laboratory chemical	Laboratory use	Worker	Probabilistic	2.2	4.5	2.7E−02	5.6E−02	2.0E−02	4.1E−02	1.7E−02	3.6E−02	6.5E−03	1.5E−02
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal	Landfill	Probabilistic	1.6	4.0	1.9E−02	5.0E−02	1.4E−02	3.7E−02	1.3E−02	3.4E−02	4.9E−03	1.4E−02
			Waste handling, treatment, and disposal	POTW and non-POTW WWT	Probabilistic	1.6	4.0	1.9E−02	5.0E−02	1.4E−02	3.7E−02	1.3E−02	3.4E−02	4.9E−03	1.4E−02

CT = central tendency; HE = high-end; POTW = publicly owned treatment works; WWT = wastewater treatment
[a] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

Table 5-24. Occupational Dermal Risk Summary Table

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30) MOE – No Gloves [a]	Intermediate Non-Cancer (Benchmark MOE = 30) MOE – No Gloves [a]	Chronic Non-Cancer (Benchmark MOE = 300) MOE – No Gloves [a]	Chronic Cancer MOE – No Gloves [a]
Life Cycle Stage	Category	Subcategory							
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing [b]	Operator	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Logistic technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Chronic Cancer
Life Cycle Stage	Category	Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing [b]	Maintenance technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Laboratory technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
			Manufacturing as an unintended byproduct [b]	Operator	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Logistics technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Maintenance technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Laboratory technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
Manufacturing	Import	Import	Repackaging	PBZ	CT	491	219	**255**	**3.7E−04**
Processing	Repackaging	Repackaging			HE	287	128	**146**	**7.4E−04**
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Processing as a reactant [b]	Operator	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Logistics technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Maintenance technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
				Laboratory technician	CT	491	219	**234**	**4.1E−04**
					HE	287	128	NE	NE
Processing	Recycling	Recycling		Herbicide manufacture	CT	491	219	**234**	**4.1E−04**
Industrial Use	Process regulator	*e.g.*, Catalyst moderator; oxidation inhibitor			HE	287	128	**137**	**7.9E−04**

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Chronic Cancer
Life Cycle Stage	Category	Subcategory				MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]	MOE – No Gloves [a]
Processing	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing Processing aids: specific to petroleum production Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Processing into formulation, mixture, or reaction product	Worker	CT	491	219	**234**	**4.1E−04**
Industrial Use	Other use	Process solvent			HE	287	128	**137**	**7.9E−04**
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	Worker	CT	535	238	359	**2.6E−04**
					HE	313	139	**182**	**5.8E−04**
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	Worker	CT	6,716	2,991	3,203	3.0E−05
					HE	3,544	1,578	1,690	6.3E−05
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Industrial and commercial non-aerosol cleaning/ degreasing	Worker	CT	494	220	**235**	**4.0E−04**
					HE	289	129	**138**	**7.8E−04**
			Commercial aerosol products (aerosol degreasing, aerosol lubricants)	Worker	CT	518	231	**247**	**3.8E−04**
					HE	302	134	**144**	**7.5E−04**

COU			OES	Category	Exposure Level	Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Chronic Cancer
Life Cycle Stage	**Category**	**Subcategory**				**MOE – No Gloves [a]**	**MOE – No Gloves [a]**	**MOE – No Gloves [a]**	**MOE – No Gloves [a]**
Commercial Use	Other use	Laboratory chemical	Laboratory use	Worker	CT	724	323	376	**2.5E−04**
					HE	356	159	**182**	**5.8E−04**
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)	Worker	CT	1,022	455	487	**1.9E−04**
					HE	397	177	**189**	**5.5E−04**
			Waste handling, treatment, and disposal (POTW and non-POTW WWT)	Worker	CT	1,022	455	487	**1.9E−04**
					HE	397	177	**189**	**5.5E−04**

PPE = personal protective equipment; NE = not evaluated
[a] Risk estimates that exceed the benchmark (*i.e.*, non-cancer risks less than the risk benchmark and cancer risks exceeding the cancer risk benchmark) are bolded and shaded.
[b] The central tendency from DEVL model is considered a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic) for closed system processes.

5.3.4 Risk Estimates for Workers from Byproducts Formed from 1,2-Dichloroethane Manufacturing

The *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l) contains details of the risk estimates of the byproducts produced during the manufacture of 1,2-dichloroethane. Risk estimates for exposure to the light-/heavy-end streams (high-end exposures) are presented in Table 5-25. Risk estimates for exposure to the unpurified 1,2-dichloroethane stream (low-end exposures) are presented in Table 5-26. High-end, screening-level exposures for trichloroethylene and carbon tetrachloride showed risk to workers; therefore, EPA further refined these analyses by performing Monte Carlo analysis to vary the concentration from the low- to high-end exposures (equal distribution) as well as separating the exposures by SEG. These results are presented in Table 5-27.

For both the high- and low-end exposure results, there is no inhalation or dermal risk estimates exceeding Agency benchmarks for 1,1-dichloroethane, perchloroethylene, or methylene chloride. Trichloroethylene presents chronic non-cancer inhalation risk for operators and laboratory technicians at high-end exposures, as well as chronic non-cancer dermal risk for workers. Carbon tetrachloride presents both chronic non-cancer and cancer inhalation risk for operators (both central tendency and high-end), maintenance technicians (high-end), laboratory technicians (high-end), and ONUs (high-end). Carbon tetrachloride also presents cancer risks for maintenance technicians (central tendency), logistics technicians (high-end), laboratory technicians (central tendency), and ONUs (central tendency). For dermal exposures, carbon tetrachloride presents chronic non-cancer and cancer risk for workers at the high-end as well as cancer risk for workers at central tendency exposures. For additional details on these estimates, refer to *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

In cases where there is estimated risk exceeding Agency benchmarks, Table 5-25 also provides the level of PPE required to meet the indicated benchmark, which is indicated using an Assigned Protection Factor (APF) in the case of inhalation exposure. APF value indicates the level of protection provided by a respirator. Again, OSHA has not established protection factors for gloves. Where no risk is estimated, no APF is provided. The test order submission from the Vinyl Institute provided data on the use of respiratory protection (Stantec ChemRisk, 2024). During the inhalation sampling study, operators wore half- or full-face, air-purifying respirators of varying types during sample collection tasks (open or closed loop), and full-face respirators of varying types during other tasks with exposure potential such as process leak response activities and filling totes. Maintenance technicians wore full-face airline respirators during major maintenance tasks (*e.g.*, line breaks and other equipment openings). Logistics technicians wore half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks. Certain laboratorypersonnel wore full-face air purifying respirators during disposal of hazardous wastes from fume hoods. ONUs were not reported to wear respiratory protection during any routine daily tasks aside from one case where a supervisor donned a full-face respirator to observe 1,2-dichloroethane loading activities from approximately 20 feet away. Standard dermal PPE for production process areas included neoprene gloves and leather or cut-resistant gloves, while task-specific PPE in this area may include nitrile gloves or viton/butyl gloves. For logistics work areas, neoprene gloves were standard and task-specific PPE may include heavy duty nitrile gloves. Nitrile gloves are standard PPE for laboratory work areas.

Although these risk estimates are presented under the Manufacturing COU, they represent independent risk from each assessed byproduct based on chemical-specific human health hazards. EPA acknowledges that workers are co-exposed to 1,2-dichloroethane and assessed byproducts at the same time and via the same route and pathway of exposure; however, combined risks are not quantified. There are uncertainties around the degree to which risk can be combined across chemicals due to the differences in health endpoints. A cumulative risk assessment across all byproducts would result in higher worker exposures and potentially higher risks compared to the exposures and risks associated with the individual byproducts.

3124 3125 **Table 5-25. Occupational Risk Summary Table for High-End Exposures (Light-/Heavy-End Streams) and PPE Level Needed to Exceed Benchmark in Cases of Risk for 1,1-Dichloroethane, Perchloroethylene, and Methylene Chloride**

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Benchmark MOEs for 1,1-Dichloroethane				**30**		**30**		**300**		**1.0E−04 (only for inhalation)**	
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	2,279	–	2.8E04	–	7,214	–	8.3E−06	–
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	High-end	394	–	4,895	–	1,248	–	6.2E−05	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	1.5E04	–	1.9E05	–	4.9E04	–	1.2E−06	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	1,316	–	1.6E04	–	4,164	–	1.9E−05	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5.3E04	–	6.6E05	–	1.7E05	–	3.6E−07	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	2,220	–	2.8E04	–	7,026	–	1.1E−05	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2.2E04	–	2.8E05	–	7.0E04	–	8.5E−07	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	1,076	–	1.3E04	–	3,407	–	2.3E−05	–
1,1-Dichloroethane	ONU	Inhalation 8-hour TWA	Central tendency	5.1E04	–	6.4E05	–	1.6E05	–	3.7E−07	–
1,1-Dichloroethane	ONU [c]	Inhalation 8-hour TWA	High-end	778	–	9,658	–	2,462	–	3.1E−05	–
1,1-Dichloroethane	All Worker SEGs	Dermal	Central tendency	2,362	–	1,052	–	1,126	–	N/A	–
1,1-Dichloroethane	All Worker SEGs	Dermal	High-end	787	–	351	–	NE [d]	–	NE [d]	–
Benchmark MOEs for Perchloroethylene				**10**		**N/A**		**10**		**1.0E−04**	
Perchloroethylene	Worker	Inhalation 8-hour TWA	Central tendency	2,620	–	N/A	–	2.4E04	–	3.6E−07	–
Perchloroethylene	Worker	Inhalation 8-hour TWA	High-end	172	–	N/A	–	1,576	–	7.0E−06	–

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Perchloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	9.0E04	–	N/A	–	8.2E05	–	1.0E−08	–
Perchloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	786	–	N/A	–	7,190	–	1.5E−06	–
Perchloroethylene	Worker	Dermal	Central tendency	157	–	N/A	–	676	–	7.3E−06	–
Perchloroethylene	Worker	Dermal	High-end	52	–	N/A	–	NE [d]	–	NE [d]	–
Benchmark MOEs for Methylene Chloride				**30**		**N/A**		**10**		**1.0E−04**	
Methylene chloride	Worker	Inhalation 8-hour TWA	Central tendency	9,514	–	N/A	–	1,373	–	2.9E−08	–
Methylene chloride	Worker	Inhalation 8-hour TWA	High-end	626	–	N/A	–	90	–	5.7E−07	–
Methylene chloride	ONU	Inhalation 8-hour TWA	Central tendency	3.3E05	–	N/A	–	4.7E04	–	8.4E−10	–
Methylene chloride	ONU [c]	Inhalation 8-hour TWA	High-end	2,854	–	N/A	–	412	–	1.2E−07	–
Methylene chloride	Worker	Dermal	Central tendency	4.3E04	–	N/A	–	5,854	–	6.5E−09	–
Methylene chloride	Worker	Dermal	High-end	1.4E04	–	N/A	–	NE [d]	–	NE [d]	–

APF = assigned protection factor; MOE = margin of exposure; NE = not estimated; PPE = personal protective equipment; TWA = time-weighted average
"–"= Inhalation APF not needed
[a] Risk estimates that exceed the benchmark (*i.e.,* a non-cancer MOE less than the benchmark or a cancer MOE exceeding the benchmark) are bolded and shaded.
[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.
[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.,* chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.
[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.,* chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

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Table 5-26. Occupational Risk Summary Table for Low-End Exposures (Unpurified 1,2-Dichloroethane Stream) and PPE Level Needed to Exceed Benchmark in Cases of Risk for 1,1-Dichloroethane, Perchloroethylene, and Methylene Chloride

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Benchmark MOEs for 1,1-Dichloroethane				**30**		**30**		**300**		**1.0E−04 (only for inhalation)**	
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	2,279	–	2.8E04	–	7,214	–	8.3E−06	–
1,1-Dichloroethane	Worker (Operators)	Inhalation 8-hour TWA	High-end	394	–	4,895	–	1,248	–	6.2E−05	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	1.5E04	–	1.9E05	–	4.9E04	–	1.2E−06	–
1,1-Dichloroethane	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	1,316	–	1.6E04	–	4,164	–	1.9E−05	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5.3E04	–	6.6E05	–	1.7E05	–	3.6E−07	–
1,1-Dichloroethane	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	1,076	–	2.8E04	–	7,026	–	1.1E−05	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2.2E04	–	2.8E05	–	7.0E04	–	8.5E−07	–
1,1-Dichloroethane	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	4,523	–	1.3E04	–	3,407	–	2.3E−05	–
1,1-Dichloroethane	ONU	Inhalation 8-hour TWA	Central tendency	5.1E04	–	6.4E05	–	1.6E05	–	3.7E−07	–
1,1-Dichloroethane	ONU [c]	Inhalation 8-hour TWA	High-end	778	–	9,658	–	2,462	–	3.1E−05	–
1,1-Dichloroethane	All Worker SEGs	Dermal	Central tendency	2.4E05	–	1.1E05	–	1.2E05	–	N/A	–
1,1-Dichloroethane	All Worker SEGs	Dermal	High-end	8.1E04	–	3.6E04	–	NE [d]	–	NE [d]	–
Benchmarks for Perchloroethylene				**10**		**N/A**		**10**		**1.0E−04**	
Perchloroethylene	Worker	Inhalation 8-hour TWA	Central tendency	2.4E05	–	N/A	–	2.2E06	–	3.8E−09	–

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Perchloroethylene	Worker	Inhalation 8-hour TWA	High-end	1.6E04	–	N/A	–	1.5E05	–	7.5E−08	–
Perchloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	8.4E06	–	N/A	–	7.7E07	–	1.1E−10	–
Perchloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	7.3E04	–	N/A	–	6.7E05	–	1.7E-08	–
Perchloroethylene	Worker	Dermal	Central tendency	1.2E04	–	N/A	–	5.0E04	–	9.9E−08	–
Perchloroethylene	Worker	Dermal	High-end	3,834	–	N/A	–	NE [d]	–	NE [d]	–
Benchmark MOEs for Methylene Chloride				**30**		**N/A**		**10**		**1.0E−04**	
Methylene chloride	Worker	Inhalation 8-hour TWA	Central tendency	2.4E04	–	N/A	–	3,413	–	1.2E−08	–
Methylene chloride	Worker	Inhalation 8-hour TWA	High-end	1,555	–	N/A	–	224	–	2.3E−07	–
Methylene chloride	ONU	Inhalation 8-hour TWA	Central tendency	8.1E05	–	N/A	–	1.2E05	–	3.4E−10	–
Methylene chloride	ONU [c]	Inhalation 8-hour TWA	High-end	7,095	–	N/A	–	1,024	–	5.0E-08	–
Methylene chloride	Worker	Dermal	Central tendency	4.3E04	–	N/A	–	5,854	–	6.5E−09	–
Methylene chloride	Worker	Dermal	High-end	1.4E04	–	N/A	–	NE [d]	–	NE [d]	–

"–"= Inhalation APF not needed; APF = assigned protection factor; NE = not estimated; PPE = personal protective equipment
[a] Risk estimates that exceed the benchmark (*i.e.*, a non-cancer MOE less than the benchmark or cancer MOE exceeding the benchmark) are bolded and shaded.
[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.
[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.
[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.

Table 5-27. Occupational Risk Summary Table and PPE Level Needed to Exceed Benchmark in Cases of Risk for Trichloroethylene and Carbon Tetrachloride Using Monte Carlo Simulation

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Benchmark MOEs for Trichloroethylene				**10**		**N/A**		**30**		**1.0E−04**	
Trichloroethylene	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	733	–	N/A	–	36	–	3.9E−06	–
Trichloroethylene	Worker (Operators)	Inhalation 8-hour TWA	High-end	171	–	N/A	–	**8.5**	85 (APF 10) [e]	2.1E−05	–
Trichloroethylene	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	2,740	–	N/A	–	136	–	1.0E−06	–
Trichloroethylene	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	614	–	N/A	–	31	–	6.0E−06	–
Trichloroethylene	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	2.4E04	–	N/A	–	1,179	–	1.2E−07	–
Trichloroethylene	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	5,662	–	N/A	–	281	–	6.5E−07	–
Trichloroethylene	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	2,658	–	N/A	–	132	–	1.1E−06	–
Trichloroethylene	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	593	–	N/A	–	**29**	295 (APF 10) [f]	6.2E−06	–
Trichloroethylene	ONU	Inhalation 8-hour TWA	Central tendency	3,983	–	N/A	–	198	–	7.1E−08	–
Trichloroethylene	ONU [c]	Inhalation 8-hour TWA	High-end	877	–	N/A	–	44	–	4.2E−06	–
Trichloroethylene	Worker	Dermal	Central tendency	1,117	–	N/A	–	61	–	1.4E−05	–
Trichloroethylene	Worker	Dermal	High-end	432	–	N/A	–	NE [d]	–	NE [d]	–
Benchmark MOEs for Carbon Tetrachloride (Inhalation)				**10**		**N/A**		**30**		**1.0E−04**	
Carbon tetrachloride	Worker (Operators)	Inhalation 8-hour TWA	Central tendency	165	–	N/A	–	**15**	147 (APF 10) [e]	**2.3E−03**	9.3E−05 (APF 25) [e]

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]
Carbon tetrachloride	Worker (Operators)	Inhalation 8-hour TWA	High-end	38	–	N/A	–	**3.4**	34 (APF 10) [e]	**1.3E−02**	1.3E−05 (APF 1,000) [e]
Carbon tetrachloride	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	Central tendency	613	–	N/A	–	55	–	**6.2E−04**	6.2E−05 (APF 10) [g]
Carbon tetrachloride	Worker (Maintenance Technicians)	Inhalation 8-hour TWA	High-end	136	–	N/A	–	**12**	122 (APF 10) [g]	**3.6E−03**	7.2E−05 (APF 50) [g]
Carbon tetrachloride	Worker (Logistics Technicians)	Inhalation 8-hour TWA	Central tendency	5,333	–	N/A	–	476	–	7.2E−05	–
Carbon tetrachloride	Worker (Logistics Technicians)	Inhalation 8-hour TWA	High-end	1,255	–	N/A	–	112	–	**3.9E−04**	3.9E−05 (APF 10) [h]
Carbon tetrachloride	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	Central tendency	601	–	N/A	–	54	–	**6.4E−04**	6.4E−05 (APF 10) [f]
Carbon tetrachloride	Worker (Laboratory Technicians)	Inhalation 8-hour TWA	High-end	131	–	N/A	–	**12**	117 (APF 10) [f]	**3.8E−03**	7.5E−05 (APF 50) [f]
Carbon tetrachloride	ONU	Inhalation 8-hour TWA	Central tendency	892	–	N/A	–	80	–	**4.3E−04**	4.3E−05 (APF 10) [i]
Carbon tetrachloride	ONU [c]	Inhalation 8-hour TWA	High-end	195	–	N/A	–	**17**	174 (APF 10) [i]	**2.5E−03**	5.1E−05 (APF 50) [i]
Carbon tetrachloride	Worker	Dermal	Central tendency	243	–	N/A	–	34	–	**1.0E−03**	–
Carbon tetrachloride	Worker	Dermal	High-end	85	–	N/A	–	NE [d]	–	NE [d]	–

APF = assigned protection factor; PPE = personal protective equipment; "–"= Inhalation APF not needed; NE = not estimated
[a] Risk estimates that exceed the benchmark (*i.e.*, a non-cancer MOE less than the benchmark or a cancer MOE exceeding the benchmark) are bolded and shaded.
[b] APF listed in parentheses is the level of protection needed for estimated MOEs to be above benchmark.
[c] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.

Chemical	Similar Exposure Group	Exposure Route and Duration	Exposure Level	Acute Non-Cancer		Intermediate Non-Cancer		Chronic Non-Cancer		Cancer	
				MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]	MOE – No PPE [a]	MOE – APF [b]

[d] The central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic) and is health protective for risk estimation for closed system processes, as high-end exposures from daily connecting/disconnecting of transfer lines and sampling is not realistic.
[e] Test order data described operators as wearing respirators with APFs ranging from 10–1,000 while performing various tasks.
[f] Test order data described laboratory technicians as wearing respirators with APFs ranging from 10–1,000 while performing various tasks.
[g] Test order data described maintenance technicians as wearing full-face airline respirators of APF 1,000 during major maintenance tasks.
[h] Test order data described logistics technicians as wearing respirators with APFs ranging from 10–50 during loading or offloading tasks.
[i] Test order data described ONUs as not wearing respiratory protection during routine daily tasks, although 1 supervisor was described as wearing a full-face respirator (APF 50) while observing loading activities from 20 feet away.

5.3.5 Risk Estimates for Consumers

Table 5-28 summarizes the dermal, inhalation, and ingestion MOEs based on 1,2-dichloroethane-specific hazards (Section 5.2.2). It also characterizes non-cancer risk for acute, intermediate, and chronic exposure to 1,2-dichloroethane and presents these values for all life stages for the consumer articles scenarios within the consumer plastic and rubber products COU. Based on published, peer-reviewed data of 1,2-dichloroethane emissions from three articles scenario, EPA conducted a screening level assessment for consumers that 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.

Table 5-28. Consumer Risk Summary Table

Life Cycle Stage: COU: Subcategory	Product or Article	Duration	Exposure Route	Life Stage (years) MOE (Benchmark MOE = 30)						
				Infants (<1 year)	Toddlers (1–2 years)	Pre-Schoolers (3–5 years)	Middle Childhood (6–10 years)	Young Teens (11–15 years)	Teenagers (16–20 years)	Adults (21+ years)
Consumer Uses: Plastic and rubber products	Ornaments	Acute	Inhalation	3,080						
			Dermal	5,200	6,100	7,100	8,800	11,000	N/A	N/A
			Ingestion (mouthing)	2,600	4,400	6,900	N/A	N/A	N/A	N/A
		Intermediate	Inhalation	33,500						
			Dermal	1,700	2,000	2,300	2,900	3,600	N/A	N/A
			Ingestion	830	1400	2,200	N/A	N/A	N/A	N/A
		Chronic	Inhalation	123,000						
			Dermal	21,000	24,000	28,000	35,000	44,000	N/A	N/A
			Ingestion	10,000	17,000	27,000	N/A	N/A	N/A	N/A
	Squishy toys	Acute	Inhalation	34,500						
			Dermal	290,000	340,000	390,000	480,000	610,000	N/A	N/A
			Ingestion (Mouthing)	180,000	670,000	130,000	N/A	N/A	N/A	N/A
		Intermediate	Inhalation	74,800						
			Dermal	94,000	110,000	130,000	160,000	200,000	N/A	N/A
			Ingestion	58,000	220,000	440,000	N/A	N/A	N/A	N/A
		Chronic	Inhalation	74,800						
			Dermal	94,000	110,000	130,000	160,000	200,000	N/A	N/A
			Ingestion	58,000	220,000	440,000	N/A	N/A	N/A	N/A
	Lamp base	Acute	Inhalation	5,860						
			Dermal	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Intermediate	Inhalation	13,400						
			Dermal	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Chronic	Inhalation	25,300						
			Dermal	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Ingestion	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = not assessed; MOE = margin of exposure
Exposures and risks via the inhalation route were assessed for all age groups. Mouthing was assessed for age groups <6 and dermal was assessed for children <16.

5.3.6 Risk Estimates for General Population

As detailed in Section 5.1.3, EPA conducted a quantitative exposure assessment for the air, land, and water pathways to evaluate non-cancer and cancer risks for the general population based on the 1,2-dichloroethane-specific hazard values (Section 5.2.2). The following sections summarize the risk estimates and conclusions for inhalation, dermal, and oral exposures for all general population exposure scenarios.

5.3.6.1 General Population Inhalation Risks via Ambient Air Methods

EPA estimated risks of general population exposures to 1,2-dichloroethane released to air, with a focus on exposures to general populations residing near 1,2-dichloroethane emitting facilities. Risks were evaluated for air releases from industrial and commercial COUs based on exposure estimated from reported and estimated ambient air releases (Section 3.2) and human health hazard values (selected PODs) (Section 5.2.2) for chronic and acute inhalation exposures (Section 5.1.3.1). EPA estimated risks using modeling results from AERMOD and HEM.

EPA estimated cancer and non-cancer inhalation risks for discrete polar-grid receptors at distances up to 10,000 m using AERMOD and for centroids of census block up to 50,000 m using HEM. Where available, EPA used facility releases reported to TRI and NEI and the associated site-specific data. EPA also used estimated releases from generic facilities/sites to calculate inhalation risks for five COUs where there were no or limited reported release data.

Risk estimates based on AERMOD modeling were calculated for the 10th, 50th, and 95th percentile exposures for each facility at each modeled distance (Section 5.1.3.1). AERMOD was run for TRI-reported releases (2015–2020), NEI-reported releases (2014 and 2017), and EPA-estimated releases for generic facilities/sites. To simplify presentation of results, the Agency is presenting general population inhalation risks at distances of 100 to 1,000, 1,000, and 2,500 m in this draft risk evaluation. These distances are presented because they overlap with the distances of the nearest census block centroids showing risk, based in the HEM results. As stated in Section 5.1.3.1, AERMOD does not consider whether populations may or may not be living near releasing facilities. Therefore, EPA ran HEM to characterize populations living near 1,2-dichloroethane-releasing facilities. HEM combines 2010 U.S. Census data with estimated ambient air concentrations to calculate MIR and the number of people within each census block with a cancer risk estimate between 1×10^{-6} and 1×10^{-4}. HEM was run using TRI data from either 2018, the year with the highest overall releases, or the highest release year from 2015 to 2021 for facilities not reporting in 2018.[13] EPA only modeled TRI-reported releases using HEM because TRI releases generally capture high-end releases that tend to drive risks. In this section, EPA is presenting only HEM results for cancer risk estimates for TRI Form R-reporting facilities. TRI facilities reporting using Form R are those that report releases above the reporting threshold and represent high-end releasing facilities; therefore, EPA is not likely to be missing facilities that might contribute to risk by only modeling Form R reporting facilities using HEM.

5.3.6.2 General Population Analysis Using HEM

Table 5-29 shows the distance from the modeled release location to the nearest census block centroid showing risk using HEM for facilities contributing risk exceeding 1×10^{-6}. Only cancer risks are being shown in this section because cancer is the driving risk for the general population via inhalation; however, the general conclusions of the section can also be applied to non-cancer risks. The results show that only facilities in OESs of Manufacturing and Processing into formulation, mixture, or reaction

[13] A preliminary review of the 2021 to 2023 TRI release data indicates that reported releases of 1,2-dichloroethane remain generally on the same order of magnitude as the 2015 to 2020 releases.

product have people living near enough to the facilities to be exposed to ambient air concentrations that would result in an inhalation cancer risk exceeding 1×10^{-6}. For the OES of Manufacturing, distances from the release location to the nearest populated census block centroid range from 735 to 2,231 m. Distances from the release location to the nearest census block range from 633 to 724 m for the OES of Processing into formulation, mixture, or reaction product. The distances from release location to nearest populated census block shown in Table 5-29 inform the distances that are presented in the general population inhalation risk sections (Sections 5.3.6.3 through 5.3.6.5). Additionally, across all facilities analyzed using HEM, the nearest census block centroid to a releasing facility, regardless of the risk, was approximately 127 m from the modeled release point. Figure 5-3 shows a map of the cancer risk estimate results for each census block as modeled by HEM. The figure shows that there are multiple facilities along the Gulf Coast that contribute to cancer risk estimates exceeding 1 in 1,000,000. The risks as calculated by HEM represent an aggregated risk across all facilities modeled.

Based on the populations of the census blocks showing the highest risk for the facilities modeled using HEM and presented in Table 5-29, the average additional cancer case per million people if exposed daily (24 hours a day for 70 years) over a lifetime would range from 7.29×10^{-6} to 1.95×10^{-4} additional cancer cases resulting from inhalation of 1,2-dichloroethane by the general population. Table 5-29 also presents the number of individuals exposed to the maximum cancer risk estimate at each centroid.

Table 5-29. Distance from Release to Nearest Census Block Showing Cancer Risk Estimates Exceeding 1×10^{-6} for Facilities Modeled Using HEM

Toxics Release Inventory (TRI) ID [a]	OES	Maximum Cancer Risk Estimates at a Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) Using HEM [d]
2814WKZNBL485CE	Processing into formulation, mixture, or reaction product	2.70E−06	18	633
29415LBRGH2151K	Manufacturing	4.00E−06	10	735
42029WSTLK2468I	Manufacturing	2.01E−05	3	1,015
60901HNKLCSKENS	Processing into formulation, mixture, or reaction product	9.44E−06	4	724
70669GRGGL1600V	Manufacturing	1.67E−06	10	1,213
70669PPGNDCOLUM	Manufacturing	6.69E−06	9	1,043
70723CCDNTHIGHW	Manufacturing	1.22E−06	6	832
70734BRDNCLOUIS	Manufacturing	6.30E−06	6	1,782
70734VLCNMASHLA	Manufacturing	2.11E−06	14	1,584
70764LLMNXHWY40	Manufacturing	2.45E−06	26	955
7076WBLCBP21255	Manufacturing	4.65E−06	18	915
70805FRMSPGULFS	Manufacturing	6.77E−06	29	1,273
7754WBLCBP231NB	Manufacturing	1.72E−06	10	2,231
77978FRMSPPOBOX	Manufacturing	1.42E−06	39	1,136

Toxics Release Inventory (TRI) ID [a]	OES	Maximum Cancer Risk Estimates at a Census Block Centroid [b]	Population of Census Block Showing Highest Risk [c]	Distance from Modeled Release Location to Centroid of Census Block Showing Highest Risk (m) Using HEM [d]

[a] Additional facilities beyond those show in the table were modeled in HEM. This table only shows facilities that contributed to a cancer risk estimate exceeding 1 in a million at a census block centroid within 50 km of the modeled release location.
[b] HEM calculates a maximum individual risk (MIR), which is equivalent to the highest cancer risk estimate for any populated receptor modeled and is shown here as the maximum cancer risk. When estimating cancer risk, HEM assumes that an individual breathes the ambient air at a given receptor site 24 hours per day over a 70-year lifetime. The MIRs in this table show the aggregated risks and they might be associated with multiple facilities. The facility associated with each MIR is the largest contributor to risk at a given census block.
[c] This population is only the population of the census block with the highest cancer risk estimated at the centroid and not the total number of people with listed estimated cancer risk resulting from a given facility's emissions. Table 5-30 provides the total number of people with an estimated cancer risk exceeding a given benchmark.
[d] This is the distance from the emission release point to the centroid of the census block that shows the highest estimated cancer risk. Table 5-31 and Figure 5-3 provide information on how far from the facility estimated cancer risks above a given benchmark extend.

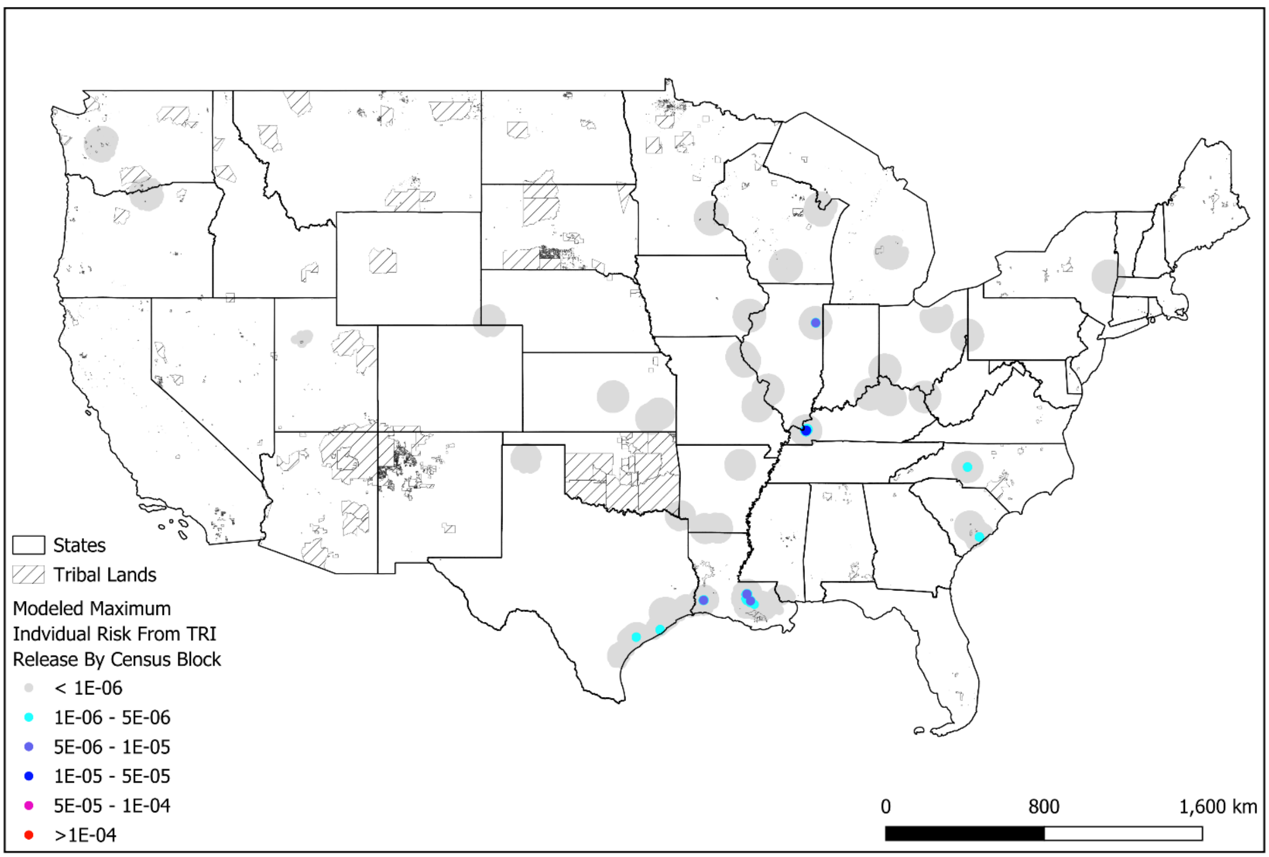

Figure 5-3. Map Showing Cancer Inhalation Risks Associated with TRI Reporting Facilities as Modeled by HEM

The HEM modeling predicted that an estimated 25,104 people across all OESs represented in TRI would have an inhalation cancer risk exceeding 1 in 1,000,000 (1×10^{-6}), 95 people would have an inhalation cancer risk exceeding 1 in 100,000 (1×10^{-5}), and 0 people would have an inhalation cancer risk exceeding 1 in 10,000 (1×10^{-4}) (Table 5-30) due to inhalation of 1,2-dichloroethane by the general population. Detailed descriptions of HEM modeling are provided the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af). Section 5.3.7 contains an analysis of populations living near releasing facilities from OESs with only NEI-reported releases where HEM modeling was not conducted. The Manufacturing OES was the largest risk contributor, with 12 facilities being the primary contributors to 22,586 people having an inhalation cancer risk estimate exceeding 1 in 1,000,000. Specifically, for the 22,586 people with an estimated cancer risk at or above 1 in 1 million (1×10^{-6}) but less than the 1 in 100,000 (1×10^{-4}) there would be an additional 0.023 to less than 0.23 additional lifetime cancer cases for the 22,586 people if exposed daily (for 24 hours each day) over a lifetime. These 12 facilities are located in Texas, Louisiana, Kentucky, Illinois, South Carolina, and North Carolina (Figure 5-3). Additionally, 2 facilities within the Processing as a reactant OES are the primary contributors to 2,519 people having a risk above the 1 in 1,000,000 but below the 1 in 100,000, which means that there would be 0.0025 to less than 0.025 additional cancer cases modeled for the 2,519 people if exposed daily over a lifetime. Moreover, the Manufacturing OES had 1 facility contributing to 95 people having an inhalation cancer risk estimate exceeding 1 in 100,000. Specifically, the maximum cancer risk for all census blocks within 50 km was 2.01×10^{-5}, which would result in 1.9×10^{-3} additional lifetime cancer cases for the 95 people with an estimated cancer risk that exceeded 1 in 100,000 assessed for the Manufacturing OES—assuming all 95 people lived in the census block with the highest risk. However, this is known to be an overestimate as there were only three people in the census block showing the highest risk (see Table 5-29).

None of the four other OESs modeled in HEM had facilities contributing to risks exceeding 1 in 1,000,000. Census block-based results are aggregated across all facilities modeled using HEM; that is, if a census block is within proximity to more than one TRI reporting facility, then the estimated concentrations, and in turn, the estimated cancer risks, from each facility release are added together for that census block. Therefore, cancer risks estimated at a census block centroid might be attributable to multiple facilities that each have different COUs. A cancer risk analysis using data from multiple reporting years for both NEI and TRI is shown in Section 5.3.6.3.

3246 3247 **Table 5-30. Total Inhalation Cancer Risk Population Count Across All Census Blocks Based on HEM Modeling Results for a Subset of TRI Release Data[a] [b]**

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [d]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [e]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Manufact-uring	Domestic manufacture	Manufacturing	Manufact-uring	24	2.01E−05	22,586	12	95	1	0	0
Import/ Repackaging	Import/ repackaging	Repackaging	Repackaging	3	5.60E−09	0	0	0	0	0	0
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; All other basic organic chemical manufacturing/recycling/ *e.g.* catalyst moderator; oxidation inhibitor	Processing as a reactant	10	3.31E−07	0	0	0	0	0	0
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/other use	Fuels and fuel additives: All other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/ adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/ process solvent	Processing into formulation, mixture, or reaction product	10	9.43E−06	2,519	2	0	0	0	0
Industrial Use	Solvents (for cleaning and degreasing	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	1	6.60−10	0	0	0	0	0	0

Life Cycle Stage	Category	Subcategory	OES	Facility Count (N) [c]	Max. Cancer Risk [b] Across all Facilities for All Census Blocks Within 50 km	Number of People Exposed to ≥1 in 1,000,000 Risk (1E−06)	Number of Facilities Contributing to Risk >1E−06 [d]	Number of People Exposed to Risk ≥1 1E−05	Number of Facilities Contributing to Risk >1E−05 [e]	Number of People Exposed to Risk ≥E−04	Number of Facilities Contributing to Risk >1E−04
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (incinerator)	16	2.32E−07	0	0	0	0	0	0

[a] Releases modeled in HEM were either using 2018 releases, as 2018 had the highest overall releases of the years used in this analysis, or the highest annual releases from the years 2015–2021 for facilities that did not report in 2018. Additionally, this table only includes facilities reporting to TRI using Form R.
[b] HEM calculates a maximum individual risk, which is equivalent to the highest cancer risk for any populated receptor modeled. When calculating cancer risk, HEM assumes that an individual breathes the ambient air at a given receptor site 24 hours per day over a 70-year lifetime.
[c] EPA is only showing HEM modeling results for TRI Form R reporting facilities.
[d] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-6}.
[e] The number of facilities in this column is the number of facilities that individually contribute to an estimated inhalation cancer risk exceeding 1×10^{-5}.

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5.3.6.3 General Population Cancer Inhalation Risks

In Sections 5.3.6.3.1 through 5.3.6.3.4, EPA is presenting cancer risk estimates compared to the range of 1×10^{-6} to 1×10^{-4} for the general population, including fenceline communities.[14] Risks are based on the 1,2-dichloroethane specific cancer and non-cancer hazards discussed in Section 5.2.

5.3.6.3.1 Estimated General Population Cancer Risks via Ambient Air Using AERMOD- and TRI-Reported Releases

Based on the results of the HEM analysis, EPA is presenting inhalation cancer risk estimates at an area distance of 100 to 1,000 m and discrete distances of 1,000 and 2,500 m (Table 5-31). AERMOD-calculated risk estimates for TRI-releasing facilities indicated that only the OES of Manufacturing exceeded 1×10^{-4} at an area distance of 100 to 1,000 m and only when considering the 95th percentile concentrations. No other OES showed risk estimates above 1×10^{-4} at distances above 100 m. Relative to 1×10^{-6}, five OESs (Manufacturing; Processing as a reactant; Processing into formulation, mixture, or reaction product; Repackaging; and Waste handling, treatment, and disposal [incinerator]) exceeded 1×10^{-6} at the distance of 100 to 1,000 m based on the 95th percentile concentrations. Only the OESs of Manufacturing and Processing into formulation, mixture, or reaction product had estimated risk estimates that exceeded 1×10^{-6} at distances greater than or equal to 1,000 m. Inhalation cancer risk estimates for the OES of Manufacturing exceeded 1×10^{-6} for distances up to 5,000 and 10,000 m based on maximum 50th and 95th percentile concentrations, respectively.

The population analysis using HEM presented in Section 5.3.6.2 suggests that the highest exposed populations are located approximately 633 to 2,231 m from facilities that are associated with the OESs of Manufacturing and Processing into formulation, mixture, or reaction product. Therefore, risk estimates calculated at an area distance of 100 to 1,000 m for the OESs of Manufacturing and Processing into formulation, mixture, or reaction product are most likely to be representative of the risks for the general population living near the highest 1,2-dichloroethane-releasing facilities. The population analysis using HEM suggests that there are unlikely to be populations exposed to concentrations of 1,2-dichloroethane via ambient air that would result in cancer risk above 1×10^{-6} for the other four OESs modeled in HEM (Processing as a reactant; Repackaging; Non-aerosol cleaning and degreasing; and Waste handling, disposal and treatment [incinerator]). Complete cancer risk results for TRI reporting facilities are provided in the *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb). Detailed descriptions of AERMOD modeling are provided in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af).

[14] Consistent with other EPA programs, for TSCA risk evaluations, EPA has generally used 1×10^{-6} to 1×10^{-4} as an acceptable cancer risk range for general population exposures. While a handful of TSCA risk evaluations relied solely on 1×10^{-6}, EPA generally believes that the use of a range is more appropriate. These values provide a range for evaluating risk but do not constitute a "bright-line."

Table 5-31. General Population Estimated Cancer Risk Summary Table at 100–2,500 m from Reported TRI Facility Releases from 2015–2020 Based on Modeled Ambient Air Concentrations Using AERMOD Model[a b c d]

COU			OES	Facility Count	Facility Count Above Benchmark (1E−06 to 1E−04) [e]	Exposure Conc. Statistic (Percentile)	Maximum Estimated Cancer Risk (Benchmark = 1E−06 to 1E−04)			Overall Confidence [f]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	24	13/0	10th	2.42E−05	1.70E−05	3.74E−06	Robust
					16/0	50th	5.23E−05	2.49E−05	5.50E−06	
					17/3	95th	2.78E−04	4.54E−05	1.03E−05	
Manufacturing /Processing	Import/ repackaging	Repackaging	Repackaging	5	0/0	10th	5.37E−08	3.67E−08	7.81E−09	Robust
					0/0	50th	1.80E−07	8.31E−08	2.01E−08	
					2/0	95th	1.53E−06	3.73E−07	7.95E−08	
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/ *e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant	12	0/0	10th	2.31E−07	1.44E−07	3.88E−08	Robust
					0/0	50th	4.69E−07	2.69E−07	7.24E−08	
					4/0	95th	2.36E−06	4.71E−07	1.21E−07	
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/ other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/process solvent	Processing into formulation, mixture, or reaction product	12	1/0	10th	2.70E−06	2.05E−06	4.36E−07	Robust
					3/0	50th	5.58E−06	3.02E−06	6.55E−07	
					4/0	95th	3.22E−05	4.32E−06	9.44E−07	
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	1	0/0	10th	3.02E−09	2.26E−09	5.69E−10	Robust
					0/0	50th	6.52E−09	4.00E−09	1.05E−09	
					0/0	95th	2.65E−08	5.96E−09	1.58E−09	

COU			OES	Facility Count	Facility Count Above Benchmark (1E−06 to 1E−04) [e]	Exposure Conc. Statistic (Percentile)	Maximum Estimated Cancer Risk (Benchmark = 1E−06 to 1E−04)			Overall Confidence [f]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (Incinerator)	19	0/0	10th percentile	1.19E−07	9.30E−08	1.93E−08	Robust
					0/0	50th percentile	2.29E−07	1.17E−07	2.54E−08	
					2/0	95th percentile	1.27E−06	2.96E−07	7.81E−08	

[a] Lifetime cancer risk estimates are based on a 78 years of continuous inhalation exposure averaged of a 78-year lifetime.
[b] Cancer risk estimates were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb).
[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by their OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk estimate from within OES.
[d] This table shows risk estimates for all OESs that are represented by TRI-reported releases regardless of how the risk estimates compare to the benchmark range.
[e] This column shows the number of facilities where the risk exceeds benchmark for the distances shown in this table. The number before the slash represents facilities with estimated cancer risks above 1E−06, while the number after the slash represents those with estimates above 1E−04.
[f] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

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5.3.6.3.2 Estimated General Population Cancer Risks via Ambient Air Using NEI-Reported Releases and AERMOD

EPA estimated inhalation cancer risk estimates via ambient air for the general population for NEI-reported releases from 2014 and 2017. The distances presented in Table 5-32 were chosen to be consistent with the distances presented in Table 5-31, and were developed following the HEM analysis 5.3.6.2. For OESs with reported NEI releases from 2014 and 2017, the maximum cancer inhalation risk estimates across all OESs resulting from the 95th percentile modeled concentrations for process-level release locations ranged from 1.33×10^{-10} to 2.25×10^{-4} for the area distance of 100 to 1,000 m. The range in risk estimates is due to the large difference in release volumes between facilities in each OES. The OES of Manufacturing had the highest associated cancer inhalation risk estimates with risk estimates for individual process-level release locations above 1×10^{-6} for distances up to 5,000 m. The Manufacturing OES had risk estimates above 1×10^{-4} at an area distance of 100 to 1,000 m. No other OES had inhalation cancer risk estimates to the general population above 1×10^{-4} at a distance exceeding 100 m. The OESs of Processing as a reactant and Processing into formulation mixture, or reaction product had risk estimates above 1×10^{-6} at distances up to 1,000 m and 2,500 m, respectively, for individual process-level release locations. No other OESs with NEI release data showed cancer inhalation risk estimates above 1×10^{-6} beyond a modeled distance of 1,000 m. For the OESs with facilities that reported to NEI but not TRI, EPA determined if there was general population living within 1,000 m of a facility by manual inspection of satellite imagery for facilities with risk estimates exceeding 1×10^{-6} at the area distance of 100 to 1,000 m. The Agency also determined that only the OES of Waste handling, disposal, and treatment (POTW) had a facility with general population living within 100 m and a risk estimate above 1×10^{-6} at an area distance of 100 to 1,000 m.

Summary tables for cancer inhalation risks for NEI reporting facilities based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table 5-32 and the *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).

Table 5-32. General Population Estimated Cancer Risk Summary Table at 100–2,500 m from Reported NEI Facility Releases from 2014 and 2017 Based on Modeled Ambient Air Concentrations Using AERMOD[a b c d]

COU			OES	Release Count [e]	Release Count Above Benchmark (1E−06/1E−04) [f]	Exposure Conc. Statistic (Percentile)	Maximum Estimated Cancer Risk (Benchmark = 1E−06 to 1E−04)			Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Manufacturing	Manufacturing	439	8/0	10th	1.82E−05	1.20E−05	2.50E−06	Robust
					21/0	50th	3.93E−05	1.94E−05	4.03E−06	
					73/2	95th	2.25E−04	3.27E−05	7.17E−06	
Import/ Repackaging	Import/ Repackaging	Repackaging	Repackaging	1,093	0/0	10th	4.25E−07	3.01E−07	4.64E−08	Robust
					0/0	50th	9.51E−07	3.77E−07	8.24E−08	
					4/0	95th	6.21E−06	7.74E−07	1.58E−07	
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/ *e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant	127	1/0	10th	1.62E−06	1.03E−06	2.23E−07	Robust
					3/0	50th	4.39E−06	2.14E−06	4.69E−07	
					10/0	95th	2.66E−05	3.99E−06	8.24E−07	
Processing/ Industrial use	Processing – incorporated into formulation, mixture, or reaction product/ other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/ adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/process solvent	Processing into formulation, mixture, or reaction product	76	2/0	10th	1.79E−06	1.33E−06	2.80E−07	Robust
					2/0	50th	5.81E−06	2.04E−06	4.42E−07	
					7/0	95th	4.47E−05	1.10E−05	2.33E−06	

COU			OES	Release Count [e]	Release Count Above Benchmark (1E−06/1E−04) [f]	Exposure Conc. Statistic (Percentile)	Maximum Estimated Cancer Risk (Benchmark = 1E−06 to 1E−04)			Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	419	0/0	10th	1.99E−07	1.53E−07	3.35E−08	Robust
					0/0	50th	4.36E−07	2.11E−07	4.64E−08	
					3/0	95th	2.44E−06	3.88E−07	8.52E−08	
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	6	0/0	10th	6.58E−12	4.23E−12	8.38E−13	Robust
					0/0	50th	1.84E−11	9.80E−12	2.04E−12	
					0/0	95th	1.33E−10	2.85E−11	5.95E−12	
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	53	0/0	10th	7.53E−08	5.27E−08	1.55E−08	Robust
					0/0	50th	1.37E−07	9.66E−08	2.92E−08	
					0/0	95th	7.38E−07	1.87E−07	5.32E−08	
Commercial Use	Other use	Laboratory chemical	Laboratory use	9	0/0	10th	6.16E−08	4.08E−08	8.88E−09	Robust
					0/0	50th	1.51E−07	7.31E−08	1.61E−08	
					0/0	95th	7.67E−07	1.75E−07	3.91E−08	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (incinerator)	103	0/0	10th	7.74E−08	5.21E−08	1.16E−08	Robust
					0/0	50th	1.85E−07	9.37E−08	2.04E−08	
					1/0	95th	1.00E−06	1.60E−07	3.28E−08	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)	147	0/0	10th	3.29E−08	2.19E−08	4.74E−09	Robust
					0/0	50th	6.48E−08	3.54E−08	7.67E−09	
					0/0	95th	3.75E−07	7.24E−08	1.85E−08	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (non-POTW WWT)	68	0/0	10th	7.74E−08	5.95E−08	1.29E−08	Robust
					0/0	50th	1.64E−07	7.74E−08	1.68E−08	
					0/0	95th	8.52E−07	1.53E−07	3.55E−08	

COU			OES	Release Count [e]	Release Count Above Benchmark (1E−06/1E−04) [f]	Exposure Conc. Statistic (Percentile)	Maximum Estimated Cancer Risk (Benchmark = 1E−06 to 1E−04)			Confidence [g]
Life Cycle Stage	**Category**	**Subcategory**					**100–1,000 m**	**1,000 m**	**2,500 m**	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (POTW)	69	0/0	10th	1.22E−07	9.59E−08	2.09E−08	Robust
					0/0	50th	2.61E−07	1.19E−07	2.64E−08	
					1/0	95th	1.37E−06	2.63E−07	5.84E−08	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (Remediation)	45	0/0	10th	2.75E−07	2.45E−07	1.00E−07	Robust
					0/0	50th	3.88E−07	3.18E−07	1.51E−07	
					0/0	95th	9.59E−07	6.72E−07	2.44E−07	
N/A	N/A	N/A	Facilities not mapped to an OES	115	0/0	10th	5.76E−08	3.82E−08	8.24E−09	Moderate
					0/0	50th	1.16E−07	6.36E−08	1.38E−08	
					0/0	95th	6.06E−07	1.04E−07	2.64E−08	

POTW = publicly owned treatment works; WWT = wastewater treatment

[a] Lifetime cancer risk estimates are based on a 78 years of continuous inhalation exposure averaged of a 78-year lifetime.

[b] Cancer risks were estimated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).

[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk estimate from within an OES.

[d] This table shows risk estimates for all OESs that are represented by NEI-reported releases regardless of how the risk compares to the benchmark range.

[e] This column shows the total number of releases (based on unique emission unit ID) associated with each OES.

[f] This column shows the number of releases (based on unique emission unit ID) where the risk exceeds benchmark for the distances shown in this table. The number before the slash represents facilities with estimated cancer risk estimates above 1E−6, while the number after the slash represents those with values above 1E−04.

[g] Rationale for the overall confidences can be found in the *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

5.3.6.3.3 EPA-Estimated Releases for Generic Facilities/Sites

For OESs where EPA used estimated releases from generic facilities/site, the maximum cancer inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 1.02×10^{-10} to 2.58×10^{-4} at 1,000 m. Because generic facilities/sites do not have actual physical locations, releases from these facilities were modeled for multiple scenarios that are meant to represent a range of release conditions. Table 5-33 shows risk estimates for modeling using the Lake Charles, Louisiana, meteorology station, which has previously been found to provide high-end estimates relative to other meteorology stations available in AERMOD (see the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q) for more information). The OES with the highest estimated inhalation cancer risk was Application of adhesives and sealants, with risk estimates above 1×10^{-6} up to the highest modeled distance of 10,000 m and risks estimates above 1×10^{-4} at distances up to 1,000 m. No other OES had risk estimates above 1×10^{-4} at a distance exceeding 100 m. The OES of Commercial non-aerosol cleaning/degreasing had risk estimates above 1×10^{-6} for distances up to 1,000 m. None of the other OESs modeled using EPA-estimated releases from generic facilities/sites showed cancer inhalation risk estimates above 1×10^{-6} at distances above 100 m. The distances presented in Table 5-33 are consistent with those presented in previous sections and are likely to represent the general population; however, since these are generic facilities/sites, there are no location data and EPA cannot fully characterize the populations that might be living near these facilities/sites. Summary tables for acute risks for OESs using modeled releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table 5-33 and *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).

Table 5-33. Maximum 95th Percentile Cancer Risks Estimated Within 100–2,500 m of Generic Facilities/Sites for OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Using AERMOD[a b c d]

OES [e]	Meteorology [f]	Land Use	100–1,000 m	1,000 m	2,500 m	Overall Confidence [g]
Industrial application of adhesives and sealants	Lake Charles, LA	Rural	1.17E−03	2.58E−04	6.41E−05	Slight
	Lake Charles, LA	Urban	3.97E−04	6.04E−05	1.32E−05	
Commercial aerosol products	Lake Charles, LA	Rural	8.09E−07	1.62E−07	3.41E−08	Slight
	Lake Charles, LA	Urban	5.21E−07	8.59E−08	1.61E−08	
Non-aerosol cleaning and degreasing	Lake Charles, LA	Rural	3.81E−05	3.40E−06	5.58E−07	Slight
	Lake Charles, LA	Urban	3.66E−05	3.23E−06	4.65E−07	
Laboratory use	Lake Charles, LA	Rural	1.12E−08	1.18E−09	2.04E−10	Moderate
	Lake Charles, LA	Urban	1.11E−08	1.11E−09	1.84E−10	

[a] See *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for discussion of EPA-modeled releases for generic facilities/sites.
[b] Lifetime cancer risk estimates are based on a 78 years of continuous inhalation exposure averaged of a 78-year lifetime.
[c] Cancer risks were estimated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[d] This table shows risks estimates for all OESs that are represented by EPA-estimated releases for generic facilities/sites regardless of how the risk compares to the benchmark.
[e] See Table 5-32 for mapping of the OES to COU mapping for the OESs of Industrial application of adhesives and sealants; Non-aerosol cleaning and degreasing; and Laboratory use. For the OES of Commercial aerosol products, the life cycle stage is Industrial Use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.
[f] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[g] The rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

5.3.6.3.4 Comparison of Estimated Inhalation Cancer Risks from Different Release Data Sources Using AERMOD

In this evaluation EPA is presenting risk estimates using releases from three different data sources: NEI-, TRI-, and EPA-estimated releases for generic facilities/sites. Figure 5-4 shows a comparison of the maximum 10th, 50th, and 95th percentile inhalation cancer risk estimates at an area distance of 100 to 1,000 m from releasing facilities. Of the OESs with releases reported to both TRI and NEI, risk estimates across the 10th, 50th, and 95th percentile differed by greater than an order of magnitude for only the OES of Processing as a reactant. For that OES, the facility with the highest risk estimates based on NEI data reported releases to NEI in 2014 that were approximately an order of higher that any of the releases reported to TRI from 2015 to 2020 or NEI in 2017. There was also an additional facility assigned to the Processing as a reactant that reported to NEI but not TRI that had risk estimates that were approximately an order of magnitude higher than the maximum risk estimates for TRI releasing facilities. The discrepancy in reported releases for the one facility for one reporting year is the reason for the differences in risk estimates for the Processing as a reactant OES presented in Figure 5-4. For the OESs of Manufacturing; Repackaging; Processing into formulation, mixture, or reaction product; and Waste handling, treatment, and disposal (incinerator), the risk estimates for the maximum 10th, 50th, and 95th percentiles estimated using TRI and NEI releases are within approximately an order of magnitude of each other. The data also suggest that risk estimates calculated based NEI and TRI are not consistently higher for one database than the other.

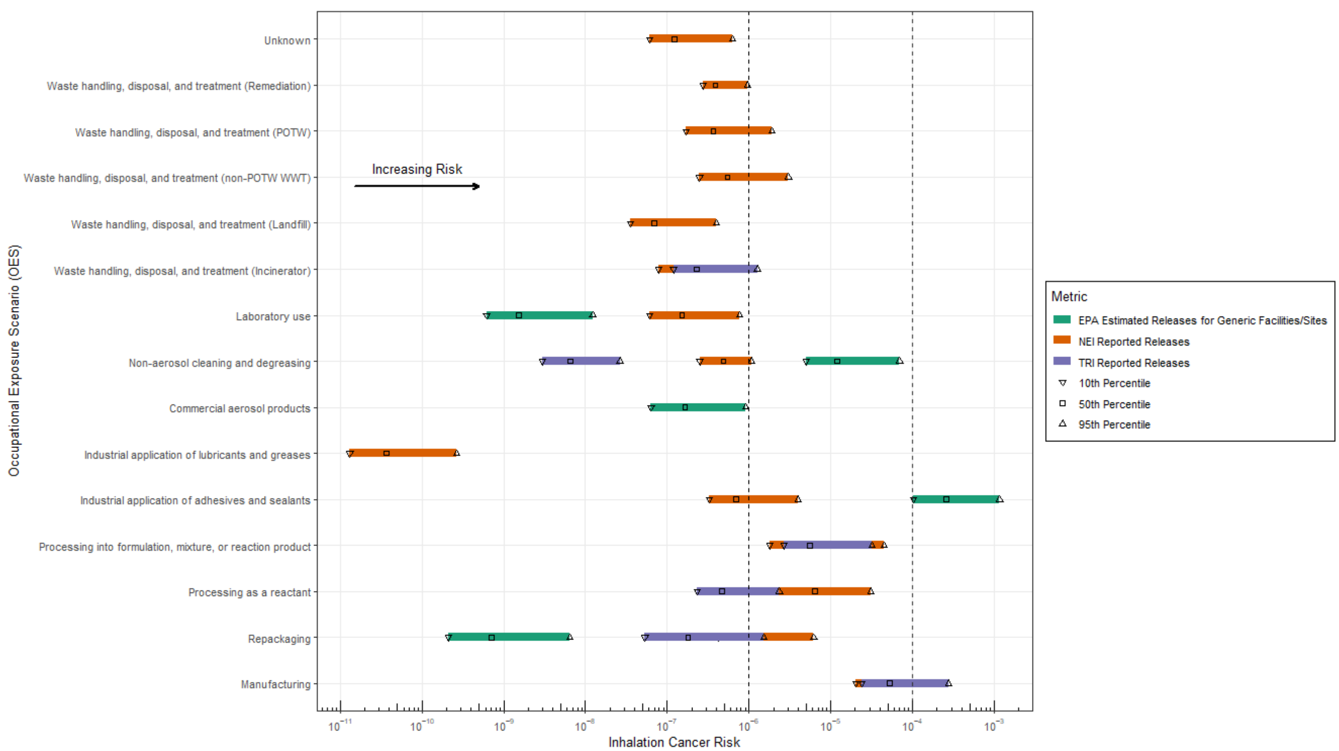

Figure 5-4. Comparison of Risk Estimates Calculated Using NEI-, TRI-, and EPA-Estimated Releases for Generic Facilities/Sites

Data presented represent the maximum 10th, 50th, and 95th percentile risk estimates for each OES at an area distance of 100 to 1,000 m. Risk estimates shown in this figure using NEI-reported releases represent total risk across all individual releases reported by a facility.

5.3.6.4 Acute Inhalation Risks by Discrete Distance Modeled with AERMOD

For OESs with reported TRI releases from 2016 to 2021, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 475 to 3.50×10^4 at 1,000 m. The OES of Manufacturing had the highest associated acute inhalation risk with risk estimates below the benchmark of 30 for distances up to 100 m. None of the other OESs with TRI release data showed acute inhalation risk below the benchmark beyond a distance of 60 m. Summary tables for acute risks for TRI-reporting facilities based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx G-1 and *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb).

For OESs with reported NEI releases from 2014 and 2017, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 90 to 1.02×10^8 for 1,000 m. The OES of Manufacturing had the highest associated acute inhalation risk with risk estimates below the benchmark of 30 for distances up to 100 m. None of the other OESs with NEI releases data showed acute inhalation risk below the benchmark beyond a modeled distance of 60 m. Summary tables for acute inhalation risks for NEI reporting facilities based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx G-2 and *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).

For OESs where EPA used estimated releases from generic facilities/site, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 71 to 3.66×10^9 for 1,000 m. The maximum risk was for the OES of Application of adhesives and sealants and was modeled using the Lake Charles, Louisiana, meteorological station (an urban land use scenario), and a 95th percentile release scenario (as described in *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag)). The Industrial application of adhesives and sealants and Non-aerosol cleaning and degreasing OESs had acute inhalation risk estimates below the benchmark of 300 at a distance of 100 m, and 60 m, respectively. None of the other OESs relying on EPA-estimated releases showed acute inhalation risk at any modeled distance. Summary tables for acute risks for OESs using EPA-estimated releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx G-3 and *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).

The distances presented in Table_Apx G-1, Table_Apx G-2, and Table_Apx G-3 were chosen to be consistent with those presented in the cancer analysis (see Section 5.3.6.3). Based on the population descriptions presented in Sections 5.3.6.2 and 5.3.6.3, it is likely that there are not general populations exposed to concentrations of 1,2-dichloroethane that would result in acute inhalation risk below the MOE.

5.3.6.5 Chronic Non-Cancer Inhalation Risks by Discrete Distance Modeled by AERMOD

For OESs with reported TRI releases from 2015 to 2020, the maximum chronic, non-cancer inhalation risks across all OESs resulting from the 95th percentile modeled concentrations range from 3.29×10^3 to 5.05×10^5 for 1,000 m. The OES of Manufacturing had the highest associated chronic non-cancer inhalation risk with risk estimates below the benchmark of 300 for distances up to 100 m (Table_Apx H-1). None of the other OESs with TRI releases data showed chronic, non-cancer inhalation risk estimates below the benchmark beyond a distance of 60 m. Summary tables for chronic, non-cancer risk estimates for TRI-reporting facilities based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx H-1 and *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb).

For OESs with reported NEI releases from 2014 and 2017, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 4.58×10^3 to 3.29×10^9 for 1,000 m. The OES of Manufacturing had the highest associated chronic, non-cancer inhalation risk with risk estimates below the benchmark of 300 for distances up to 100 m. None of the other OESs with NEI release data showed chronic, non-cancer inhalation risk below the benchmark beyond a modeled distance of 60 m. Summary tables for chronic, non-cancer inhalation risks for NEI-reporting facilities based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx H-2 *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).

For OESs where EPA used estimated releases from generic facilities/site, the maximum acute inhalation risks across all OESs resulting from the 95th percentile modeled concentrations ranged from 579 to 1.06×10^{10} for a distance of 1,000 m. The maximum risk was for the OES of Application of adhesives and sealants and was modeled using the Lake Charles, Louisiana, meteorological station (an urban land use scenario) and a 95th percentile release scenario (as described in *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag)). The Application of adhesives and sealants and Industrial and commercial non-aerosol cleaning/degreasing OESs had risk estimates below the benchmark of 300 at an area distance of 100 to 1,000 m, and 60 m, respectively. None of the other OESs relying on EPA-estimated releases showed chronic non-cancer inhalation risk at any modeled distance. Summary tables for chronic, non-cancer inhalation risks for OESs using EPA-estimated releases based on the 10th, 50th, and 95th percentile modeled concentrations up to 10,000 m are presented in Table_Apx H-3 and *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).

The distances presented in Table_Apx G-1, Table_Apx G-2, and Table_Apx G-3 were chosen to be consistent with those presented in the cancer analysis (see Section 5.3.6.3). Based on the population descriptions presented in Sections 5.3.6.2 and 5.3.6.3, it is likely that there are not general populations exposed to concentrations of 1,2-dichloroethane that would result in chronic, non-cancer inhalation risk below the MOE.

5.3.6.6 General Population Risk Estimates from Oral Exposures

EPA estimated exposures to 1,2-dichloroethane via the oral route from several sources, including drinking water exposures, fish ingestion exposures, incidental ingestion from swimming in receiving water bodies, and soil ingestion from soil treated with biosolids containing 1,2-dichloroethane. Ingestion of 1,2-dichloroethane via surface water or soil is based on reported releases from facilities as found in the TRI and DMR. Summaries of these exposures are provided in Section 5.1.3.3. EPA summarized the highest exposures per COU/OES to quantify the highest potential risks associated with these exposures. The full exposure and risks are presented in supplemental files *Draft Fish Ingestion Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025ai) and *Draft Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2025ac).

EPA evaluated oral exposures to 1,2-dichloroethane via drinking water ingestion. A refined analysis was conducted to consider the concentration of 1,2-dichloroethane downstream of those releasing facilities within each COU/OES at the point of drinking water treatment facility intakes (see Table 5-12). The highest drinking water exposures were acute exposures to infants (7.9×10^{-3} mg/kg/day) from the Waste handling, treatment, and disposal OES releases. The acute risk for infants from this exposure is 2,535, which is above the benchmark MOE of 30. EPA has robust confidence in the risk estimates for drinking water ingestion.

EPA conducted a screening level assessment for fish ingestion by estimating the highest surface water concentrations of 1,2-dichloroethane, and thus, highest fish tissue concentration per OES. The OES with the highest fish ingestion acute exposures was Waste handling, treatment, and disposal OES for toddlers at 2.5×10^{-3} mg/kg/day (see Table 5-14). The corresponding acute risk for toddlers was 7,960, which is well above the acute benchmark MOE of 30. For chronic exposures via fish ingestion associated with Waste handling, treatment, and disposal OES releases were 3.83×10^{-4} mg/kg/day. The corresponding risks were 16,992, which is above the chronic benchmark MOE of 300. EPA has robust confidence in (1) the risk estimates for fish ingestion, and (2) that other releases with lower surface water concentrations would likewise have lower fish ingestion exposures and even lower acute and chronic risk estimates.

EPA also evaluated fish ingestion exposures from releases on Tribal lands in Arizona as these populations have 10 times higher fish ingestion rates (2.7 g/kg/day) than the general population (0.277 g/kg/day). The releases of 1,2-dichloroethane were low and the concentration of 1,2-dichloroethane in the receiving water body (Chinle Wash) was also relatively low (5.2 µg/L). The highest exposures were acute Tribal fish ingestion exposures and were estimated as 6.18×10^{-5} mg/kg/day. The associated risk with the acute fish ingestion exposure was 322,006—well above the acute benchmark MOE of 30.

For incidental ingestion, EPA considered the highest exposure for screening for risk across all of the COUs/OESs releasing to surface water. The highest exposures were from releases associated with the Disposal COU for youths (ages 11–15 years) with acute exposures of 0.014 mg/kg/ (see Table 5-13). The corresponding MOEs were 1,425, which is above the benchmarks of 30 for acute. EPA did not evaluate further risks from other oral exposures from incidental ingestion associated with other OESs as they also would be above benchmarks.

EPA conducted a screening analysis of exposures from ingestion of soil and estimated high-end exposures from the Manufacturing OES releases as 3.39×10^{-5} mg/kg/day (see Section 5.1.3.3.3). EPA uses the MOE to estimate risk and acute and chronic risks are 587,021 and 191,740, respectively—which are well above the acute and chronic benchmark MOEs of 30 and 300, respectively. The Agency therefore has robust confidence that there is low risk to 1,2-dichloroethane from oral exposures through soil ingestion. EPA did not evaluate further risks from other oral exposures from soil ingestion associated with other OESs.

5.3.6.7 General Population Risk Estimates from Dermal Exposures

EPA assessed possible risk from dermal exposures via swimming in surface waters receiving facility discharges from TSCA COU/OES. Across all OESs, the highest dermal exposure is from Waste handling, treatment, and disposal OES releases for adults. The adult acute dermal exposures are 2.1×10^{-3} mg/kg/day. The corresponding associated risks are 9,566 for acute, which are above the benchmark MOEs of 30. Because dermal exposures were lower for the other remaining OESs, EPA did not further quantitatively assess risk as they would be lower than those for Waste handling, treatment, and disposal and would not be below the benchmark MOEs. EPA has robust confidence that there are no dermal risks for non-cancer below benchmark.

5.3.6.8 General Population Risk Estimates from Byproducts

EPA did not find acute or chronic non-cancer or cancer inhalation risks for the general population that exceeded a benchmark for any of the byproducts based on an analysis using HEM. The estimated inhalation risks to the general population from the assessed byproducts are expected to be high-end estimates for the following reasons (1) EPA used TRI-reported releases of 1,2-dichloroethane from the year with the highest releases, 2018, within the 2015 to 2020 evaluation period; (2) 2018-reported releases of 1,2-dichloroethane were used to calculate releases of each byproduct using percentages provided by industry presented in Table 3-2 that represent high-end estimates of the typical composition of each byproduct (a comparison to the releases used in the fenceline analyses and *Risk Evaluation for 1,1-Dichloroethane* (U.S. EPA, 2025bj) indicates that the releases modeled in this assessment are unlikely to be overestimated); and (3) the exposure scenarios assume continuous exposure (1 day for acute risk, 1 year for chronic non-cancer risks, and 70 years for cancer risks). The risks calculated using the percentages of each byproduct in the non-purified product stream are likely to represent high-end estimates.

Based on the data presented in the *Draft 1,2-Dichloroethane Byproducts Assessment* TSD (U.S. EPA, 2025l), EPA concludes there are no anticipated cancer risks nor risks below benchmark for acute or chronic non-cancer exposures to the general population from byproduct exposures released to surface waters. This conclusion is based primarily on the lower releases and corresponding lower concentrations of each of the byproduct chemicals than those presented in the fenceline analyses for the analogs perchloroethylene, trichloroethylene, and methylene chloride. Likewise, the 1,1-dichloroethane risk evaluation estimated greater surface water releases of 1,1-dichloroethane to the same receiving water body yet did not result in general population non-cancer or cancer risks. And lastly, for carbon tetrachloride, a screening analysis estimating receiving water concentrations from byproduct release anticipated no associated cancer or non-cancer risks to general population exposures.

5.3.6.9 Characterization and Summary of Risk Estimates for General Population

Table 5-34 below presents a summary of the risk estimates for the three main exposure scenarios associated with facility releases: ambient air inhalation, drinking water ingestion (via surface water), and fish ingestion. Risk estimates presented below are based on the 1,2-dichloroethane-specific hazards described in Section 5.2.

5.3.6.9.1 Characterization and Summary of Risk via Inhalation of Ambient Air for General Population

For the ambient air pathway, Table 5-34 compiles data from Sections 5.3.6.2 through 5.3.6.5. This section provides an overview of the factors used to estimate the cancer and non-cancer risks to the general population, with each major factor being described in its own subsection.

Releases

The Agency identified five OESs with facility releases of 1,2-dichloroethane to the ambient air as reported to EPA TRI and NEI databases (Manufacturing; Repackaging; Processing as a reactant; Processing into formulation, mixture, or reaction product; and Waste handling disposal and treatment). EPA identified one OES with no reported releases (Commercial aerosol products); therefore, the Agency relied on estimated releases from generic facilities/sites for modeling this OES. The remaining three OESs evaluated had both facility-reported and modeled releases (Industrial application of lubricants and greases; Industrial application of adhesives and sealants; Non-aerosol cleaning and degreasing; and Laboratory use). Table 5-35 presents the data sources that were available for each OES and the notes associated with the OES column in Table 5-34 show which data source was used in development of the presented risk estimates.

When using AERMOD, EPA individually modeled (for each facility) all reported releases from TRI from the reporting years of 2015 to 2020, all reported facility releases from NEI from the reporting years of 2014 and 2017, and all EPA-estimated releases for generic facilities/sites. HEM was run using TRI data for either facility releases reported for 2018, the highest overall release year of the years analyzed in this evaluation, or the highest release from 2015 to 2021 for facilities that did not report releases in

2018. Total air emissions across the five years of TRI release that were assessed in this 1,2-dichloroethane draft risk evaluation were relatively consistent, with total releases ranging from 148,590 to 204,249 kg/year.

Modeling Methodologies

EPA used two modeling approaches to estimate ambient air concentrations resulting from facility releases of 1,2-dichloroethane: (1) AERMOD to model concentrations at user-defined distances (discrete and area distances) from releasing facilities, and (2) HEM to model concentrations at the centroid of each census block across the nation. Although HEM was used to model ambient air concentrations at user-defined distances, the results are not presented in this evaluation because the results would duplicate the comprehensive modeling done using AERMOD as a standalone model (for both facility-reported releases and releases estimated for generic facilities/sites for all reporting years evaluated in this assessment). AERMOD has been peer reviewed as part of the regulatory model process described in Appendix W to 40 CFR part 51. HEM was developed by EPA's Office of Air and Radiation (OAR) and runs AERMOD as a compiled executable program to model ambient air concentrations. Both HEM and AERMOD are used in a fit for purpose manner for this 1,2-dichloroethane draft risk evaluation. Furthermore, the AERMOD has undergone testing and validation in comparing predicted and measured air concentrations and has been externally peer reviewed (Cimorelli et al., 2018).

Release Site Physical Characteristics Input Data

For 10 of the OESs evaluated in this assessment, EPA had site-specific, facility-reported releases available for use as direct inputs to AERMOD and HEM. Availability of facility-reported data allows for use of site-specific information—such as facility location, stack height, meteorological data, and land cover—as model inputs. However, some model inputs, such as release days and stack parameters, are not consistently available for all facilities across all databases and assumptions were made for these characteristics based on information from the EPA National-scale Air Toxics Assessment and the source classification code of the facility, as described in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af). For instance, stack information is not available in TRI, which was the basis of the HEM analysis; however, a comparison of risks based on data submitted to TRI as well as NEI (the latter does have stack information available) shows good agreement between the results when using each database for input parameters—especially for the Manufacturing OES, which is the major driver of risk (Section 5.3.6.3.4). Additionally, for the Manufacturing OES, all releases reported to NEI had reported stack heights, exit temperatures, and stack diameters, while 80 percent reported exit gas velocity. Other parameters, such as release days, were developed on an OES basis in the evaluation and are described in Section 3.1. The assumed stack parameters generally, but not necessarily always, represent a slow-moving, low-to-the-ground plume with limited dispersion that results in a more conservative estimate of concentrations at the distances evaluated. Additionally, AERMOD and HEM modeling used the meteorological station closest to each facility for all facility-reported releases, which means that estimated ambient air concentrations account for local meteorological conditions such as temperature, precipitation, and wind direction. For the one OES where there was no facility-specific release data, assumptions from the generic scenario (see Section 3.1) were used to estimate releases.

Exposure Scenarios and Exposure Factors

For the analysis using AERMOD, EPA assumed a 78-year lifespan and a constant exposure over an entire lifetime. The 78-year lifespan is the average life expectancy of the general population (U.S. EPA, 2011a). An exposure duration of 78 years was assumed to be protective of PESS groups and communities that are located near releasing facilities. Note that the assumption of 78 years of exposure does not necessarily indicate that people are stagnant; rather, it is meant to characterize anyone that resides, works, or remains within approximately the same distance from a facility for their entire lifetime. It is also consistent with previous recommendations from the Science Advisory Committee on Chemicals (SACC; accessed August 13, 2025) (U.S. EPA, 2023c). The default exposure scenario in HEM assumes an exposure duration of 70 years and a lifetime of 70 years. For both the HEM and AERMOD analyses, the averaging time and exposure time are the same, which means the risks calculated using both models can be directly compared. Overall, the assumption of a constant exposure over a lifetime of either 70 or 78 years is a conservative assumption that will result in high-end risk estimates. Additionally, for the purposes of this draft risk evaluation, EPA is assuming that indoor air concentrations are equal to the 1,2-dichloroethane ambient air concentrations from releasing facilities.

Hazard Values Used for Risk Calculations

The current proposed POD of 48.9 mg/m^3 is based on BMD modeling of degeneration with necrosis of the olfactory (nasal) mucosa in male and female mice after an 8-hour exposure to 1,2-dichloroethane vapor for acute non-cancer inhalation exposure. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 9.78 mg/m^3 using the regional gas dose ratio for extrathoracic effects ($RGDR_{ET}$) of 0.2 for these nasal effects and is applying the animal to human extrapolation factor (*i.e.*, interspecies extrapolation; UF_A) of 3× and a within human variability extrapolation factor (*i.e.*, intraspecies extrapolation; UF_H) of 10×. Thus, for the acute duration, a total UF of 30× is applied for use as the benchmark MOE.

The current proposed POD of 21.2 mg/m^3 is based on BMD modeling of decreased sperm concentration in male mice after a whole body, 6 hour/day, 7 day/week, 4-week exposure to 1,2-dichloroethane vapor to estimate non-cancer risks from inhalation to 1,2-dichloroethane for the intermediate/chronic durations of exposure. The Agency, in accordance with (U.S. EPA, 1994) guidance, calculated the HEC of 21.2 mg/m^3, which is equal to the proposed POD by using the default regional gas dose ratio (RGDR) for the systemic (sperm) effects of 1. Additionally, EPA is applying the animal to human extrapolation factor (UF_A) of 3× and a within human variability extrapolation factor (UF_H) of 10×. The use of a duration adjustment factor (*i.e.*, subchronic to long-term [chronic] duration adjustment, UF_S) of 10× was applied for the chronic duration, specifically. Thus, a total UF of 30× is applied for use as the benchmark MOE for the intermediate duration and 300× chronic duration, respectively.

The 1,2-dichloroethane inhalation cancer study by Nagano (2006) is the basis for the IUR of 7.1×10^{-6} per $\mu g/m^3$ derived from the lower confidence limit of the BMD (BMDL) for the 95 percent confidence level modeled data at a benchmark response (BMR) of 10 percent extra risk to estimate cancer risks from inhalation to 1,2-dichloroethane based on a combined tumor model (mammary gland adenomas, fibroadenomas, and adenocarcinomas and subcutaneous fibromas) in female rats.

Comparison of Modeled and Monitored Data

EPA performed a detailed comparison of modeled and monitored data for a facility in Calvert City, Kentucky. The comparison showed that the modeled 95th percentile average daily concentrations and the maximum one-day monitored 1,2-dichloroethane concentrations from the AMTIC archive were within an order of magnitude of each other when the monitoring location was within 300 m of the modeled distance and the max 1-day monitored concentrations being greater than the modeled 95th percentile average daily concentrations. The comparison of estimated and measured exposures shows that the two were similar, which strengthens the confidence that the modeled concentrations are representative of actual concentrations near releasing facilities. See *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) for more details.

Population Characterization and Cancer Risk Estimates Using HEM

HEM was used to characterize the general population living near facilities releasing 1,2-dichloroethane. For risks calculated at census block centroids, which is a single discrete location, the risk is calculated using the annual average concentrations (daily averages of hourly estimated concentrations averaged across 365 days) that account for the conditions of that specific location such as prevailing winds. The census block-level analysis using HEM provides total population with MOE estimates above 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} (Table 5-30). Table 5-29 shows the distance from the releasing facility to the nearest census block centroid for facilities contributing to MOE estimates above 1×10^{-6}. The results of the HEM modeling show that the nearest populated census block centroid showing risk above 1×10^{-6} is 633 m from a release location. The results of the HEM modeling did not identify any census block centroids for populated census blocks that would result in inhalation cancer risk estimates above 1×10^{-4} when assuming the location of the census block centroid is an appropriate estimation for the location of all people living within a census block. Across all facilities modeled using HEM, the nearest census block centroid, regardless of risk, was approximately 127 m from the modeled release location. The HEM results are suggestive that most people likely do not live nearer than 127 m from the 1,2-dichloroethane releasing locations that were modeled using HEM; therefore, in Table 5-34, EPA is presenting risk estimates at an area distance of 100 to 1,000 m for all OESs.

Cancer Risk Estimates at Radial Distances

As previously stated, all facility-reported releases for every facility for every release year assessed in this evaluation (2015–2020 for TRI and 2014 and 2017 for NEI) were modeled individually. For each year and each facility, EPA calculated an annual average concentration (daily averages of hourly estimated concentrations were averaged across 365 days) for each modeled receptor location. From the resulting distribution of annual average concentrations for each receptor at a given radial distance (16 for discrete radial distances), select statistics (*e.g.*, the 50th and 95th percentile) were calculated. Table 5-34 presents the resulting maximum 50th and 95th percentile concentrations across all years and all facilities within an OES (the table notes associated with the OES column show which data source was used in development of the presented risk estimates). The 95th percentile (high-end) concentrations reflect levels typical of locations predominantly downwind of releasing facilities, whereas the 50th percentile (central tendency) concentrations account for variability based on wind direction. Use of the 95th percentile exposures is protective of the most highly exposed subpopulations.

Based on the results of the HEM analysis, which shows populations with cancer inhalation risks exceeding 1×10^{-6} living distances as near as 633 m, Table 5-34 presents risk at an area distance of 100 to 1,000 m. (Note that as stated in Section 5.3.6.3, EPA is presenting cancer risk estimates compared to the range of 1×10^{-6} to 1×10^{-4} for the general population, including fenceline communities.) Using the 95th percentile risk estimates at an area distance of 100 to 1,000 m, the Manufacturing OES has the highest 1,2-dichloroethane cancer risk estimate of 2.78×10^{-4}. The facility showing the highest risk estimates is the same facility for which a direct comparison of modeled results and monitoring data was performed in the *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af) and discussed above and in Sections 3.3.1 and 5.1.3.1, with the comparison that modeled and monitored concentrations were within an order of magnitude when the monitoring location was within 300 m of the modeled distance. For this facility, maximum yearly risks based on the 95th percentile concentrations for the 5 years of TRI data evaluated ranged from 1.18×10^{-4} to 2.78×10^{-4} at the area distance of 100 to 1,000 m, with total reported releases ranging from 48,199 to 119,747 lb/year. For comparison, the facility with the second highest estimated cancer risk across all years assessed based on TRI-reported releases and associated with the Manufacturing OES had an estimated risk of 1.09×10^{-4} at an area distance of 100 to 1,000 m based on the 95th percentile concentrations and the 2017 release amount of 39,348 lb. Based on the HEM analysis, the nearest populated census block for this facility is 955 m from the modeled release location and the associated estimated risk was 2.45×10^{-6} based on the 2018 total reported facility release of 19,135 lb. Thus, there was no population exposed at a maximum yearly risk of 1.18×10^{-4} to 2.78×10^{-4} based on the population analysis using 2020 census data described in Section 5.3.6.2. When considering the byproducts associated with the Manufacturing OES, no individual byproduct showed either cancer or non-cancer inhalation risk to the general population.

Four other OESs had cancer risk estimates above 1×10^{-6} at an area distance of 100 to 1,000 m (Repackaging; Processing as a reactant, Processing into formulation, mixture, or reaction product; and Waste handling, treatment, and disposal [POTW]). No OES other than Manufacturing had inhalation cancer risk estimates 1×10^{-4} at distances exceeding 100 m. Overall, the OESs of Manufacturing; Processing into formulation, mixture, or reaction product; and Waste handling, treatment, and disposal (POTW) indicated facilities with population living within 1,000 m of the modeled release location. A manual review of satellite images showed that one facility in the OES of Waste handling, treatment, and disposal (POTW) had a cancer risk estimate above 1×10^{-6} at an area distance of 100 to 1,000 m and had population living within 1,000 m of the release location (see Section 5.3.6.3.2 and Table 5-35). Overall confidences in the risk estimates for each OES are detailed in Section 5.3.8.2.

Estimated Cancer Incidence Due to Ambient Air Inhalation of 1,2-Dichloroethane by the General Population

EPA also calculated additional cancer incidence rates based on the HEM results by multiplying population numbers by either the estimated cancer risks at specific census blocks or risk thresholds (Section 5.3.6.2). Across the entire population assessed of 31,133,795 people (which includes all populations living in each census block with a centroid within 50 km of any of the modeled release location), there would be an additional 0.47 lifetime cancer cases, calculated by summing the increased cancer cases based on the population and estimated cancer risk at a specific census block. Table 5-30 estimated that 22,586 people would have an estimated cancer risk between 1×10^{-6} to 1×10^{-5}, which would result in 0.023 to 0.23 additional lifetime cancer cases for the 22,586 people associated with facilities under the Manufacturing COU. Another way to characterize these increased cancer incidences is that there would be an estimated additional 3.30×10^{-4} to 3.30×10^{-3} excess cases per year when assuming a 70-year lifetime for the 22,586 people. For the census block with the highest cancer risk estimate (2.01×10^{-5}), there would be a 6.03×10^{-5} additional lifetime cancer cases (8.61×10^{-7} additional cases annually based on a 70-year lifetime) based on the population of three people.

Additionally, for that same census block with the highest cancer risk estimate, there are two facilities that contribute to risk, with one contributing a large majority of the risk (note that this is the same facility that presents the largest overall risk presented in Table 5-34). This facility, which is associated the Manufacturing OES, is in a relatively rural area that is not densely populated; therefore, small changes in population would have a large impact on the overall incidence on the census block with the highest estimated cancer risk (*i.e.*, an increase in population of 1 person would increase the cancer incidence by 33%). For the 95 people with risks exceeding 1×10^{-5}, there would on average be at least 9.50×10^{-4} additional lifetime cancer cases (1.36×10^{-5} additional cases annually based on a 70-year lifetime). Additionally, the same facility that was the largest contributor to risk at the census block centroid with the highest estimated cancer risk in the OES of Manufacturing is also the major contributor to the estimated cancer risks exceeding 1×10^{-5}. Overall, the increased cancer risk incidence calculations show that the total number of additional cancer cases due to inhalation exposure to 1,2-dichloroethane is relatively low across the entire population.

Acute and Chronic Non-Cancer Ambient Air Inhalation Risks

For estimated acute and chronic non-cancer risks, there were no risk estimates below the MOEs of 30 and 300, respectively, for radial distances above 100 m for OESs with reported release data. Based on the population descriptions presented in Sections 5.3.6.2 and 5.3.6.3, there are likely no general populations exposed to concentrations of 1,2-dichloroethane that would result in acute or chronic non-cancer inhalation risk below the MOE.

5.3.6.9.2 Characterization and Summary of Risk via Exposure to Surface Water for General Population

No MOE estimates below the chronic non-cancer benchmark and above the cancer benchmark were identified for drinking water or fish ingestion. Acute oral or dermal exposures do not result in MOE estimates below the non-cancer benchmark in the swimming scenario. When considering the byproducts associated with the Manufacturing OES, no individual byproduct showed either cancer or non-cancer risk to the general population via dermal and oral exposures.

Table 5-34. General Population Risk Summary for Exposures via Ambient Air Inhalation, Drinking Water Ingestion, and Fish Ingestion for Facility-Reported Releases and EPA-Estimated Releases for Generic Facilities/Sites for all OESs

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a,g,h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)	Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)
Manufacture/ Domestic manufacturing	Domestic manufacture	Manufacturing [d]	Ambient Air Inhalation	Central tendency	6.66E04	2,860	5.23E−05 (risk above 1E−6 up to 1,000 m, risk above 1E−6 up to 10,000 m, population indicated based on HEM analysis) [i]
				High-end	168	329	2.78E−04 (no risk above 1E−4 beyond the area distance of 100–1,000 m, risk above 1E−6 up to 10,000 m, population indicated based on HEM analysis) [i]
			Drinking Water Ingestion	Central tendency	5.8E07	1.3E08	N/A
				High-end	1.6E07	5.2E07	N/A
			Fish Ingestion	Central tendency	1.5E04	2.1E04	N/A
				High-end	9.8E03	2.5E04	N/A
Manufacture/ Import and processing/ Repackaging	Import and packaging	Repackaging [d]	Ambient Air Inhalation	Central tendency	7.59E06	8.29E05	1.81E−07
				High-end	3.50E04	9.74E04	1.53E−06 (no risk above 1E−6 at distances beyond the area distance of 100–1,000 m, no population indicated based on HEM analysis) [i]
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)	Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)
Processing/ Processing –as a reactant; Processing/ Recycling; and Industrial use/Process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing/ Recycling/ *e.g.*, Catalyst moderator; Oxidation inhibitor	Processing as a reactant [d]	Ambient Air Inhalation	Central tendency	1.35E06	3.18E05	4.96E−07
				High-end	2.02E04	6.32E04	2.36E−06 (no risk above 1E−6 at distances beyond the area distance of 100–1,000 m and no population indicated based on HEM analysis) [i]
			Drinking Water Ingestion	Central tendency	1.3E09	2.3E09	N/A
				High-end	3.8E08	8.8E08	N/A
			Fish Ingestion	Central tendency	1.3E05	1.8E05	N/A
				High-end	8.5E04	2.2E05	N/A
Processing/ Processing – incorporated into formulation, mixture, or reaction product and Industrial use/Other use	Fuels and fuel additives: All other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticides, fertilizer, and other agricultural chemical manufacturing/ process solvent	Processing into formulation, mixture, or reaction product [d]	Ambient Air Inhalation	Central tendency	2.61E06	2.68E04	5.58E−06 (no risk above 1E−6 at distances beyond the area distance of 100–1,000 m and population indicated based on HEM analysis) [i]
				High-end	1,390	4,640	3.22E−05 (no risk above 1E−6 at distances beyond the area distance of 100–1,000 m and population indicated based on HEM analysis) [i]
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)	Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)
Industrial Use/ Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants [e]	Ambient Air Inhalation	Central tendency	3.44E04	3.43E05	4.36E−07
				High-end	1.79E04	6.12E04	2.44E−06 (no risk above an area distance of 100–1,000 m and no population based on HEM analysis) [i]
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Industrial Use/ Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases [e]	Ambient Air Inhalation	Central tendency	7.65E10	8.13E09	1.84E−11
				High-end	4.05E08	1.12E09	1.33E−10
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Industrial Use/Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Commercial aerosol products [f]	Ambient Air Inhalation	Central tendency	N/A	2.29E07	1.35E−07
				High-end	8.59E04	5.64E06	8.09E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Industrial Use/Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing [e]	Ambient Air Inhalation	Central tendency	3.57E08	5.88E04	6.52E−09
				High-end	1.42E06	1.80E04	2.65E−08

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)	Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)
Industrial Use/Solvents (for cleaning and degreasing) (continued)	Degreasing and cleaning solvents (continued)	Non-aerosol cleaning and degreasing [e] (continued)	Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Commercial use/Other use	Laboratory Chemical	Laboratory use [e]	Ambient Air Inhalation	Central tendency	4.20E06	9.88E05	1.51−07
				High-end	5.44E04	1.95E05	7.67E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Disposal/Disposal	Disposal	Waste handling, treatment, and disposal (incinerator) [d]	Ambient Air Inhalation	Central tendency	1.78E07	6.52E05	2.29E−07
				High-end	3.32E04	1.18E05	1.27E−06
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
Disposal/Disposal	Disposal	Waste handling, treatment, and disposal (landfill) [e]	Ambient Air Inhalation	Central tendency	1.60E07	2.31E06	6.48E−08
				High-end	1.35E05	3.99E05	3.75E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)	Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)
Disposal/Disposal	Disposal	Waste handling, treatment, and disposal (non-POTW-WWT) [e]	Ambient Air Inhalation	Central tendency	1.42E06	9.11E05	1.64E−07
				High-end	5.53E04	1.75E05	8.52E−07
			Drinking Water Ingestion	Central tendency	8.9E03	2.1E04	N/A
				High-end	2.5E03	8.1E03	N/A
			Fish Ingestion	Central tendency	1.2E04	1.7E04	N/A
				High-end	7.9E03	2.0E04	N/A
Disposal/Disposal	Disposal	Waste handling, treatment, and disposal (POTW) [e]	Ambient Air Inhalation	Central tendency	8.99E06	5.73E05	2.61E−07
				High-end	3.24E04	1.09E05	1.37E−06 (no risk above an area distance of 100–1,000 m; population indicated based on manual inspection of satellite imagery) [i]
			Drinking Water Ingestion	Central tendency	8.9E04	1.1E06	N/A
				High-end	2.5E04	4.5E05	N/A
			Fish Ingestion	Central tendency	3.1E04	4.4E05	N/A
				High-end	3.2E05	1.0E05	N/A
Disposal/Disposal	Disposal	Waste handling, treatment, and disposal (remediation) [e]	Ambient Air Inhalation	Central tendency	2.03E06	3.85E05	3.88E−07
				High-end	2.63E04	1.56E05	9.59E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

Life Cycle Stage/Category	Subcategory	OES	Exposure Route [a g h]	Exposure Level [b]	Risk Estimates for Each Exposure Scenario [c]		
					Maximum Acute Non-Cancer Risk (Benchmark MOE: Oral = 30; Inhalation = 30)	**Maximum Chronic Non-Cancer Risk (Benchmark MOE: Oral = 300; Inhalation = 300)**	**Maximum Cancer Risk (Benchmark = 1E−06 to 1E−04)**
N/A	N/A	Facilities not mapped to an OES [e]	Ambient Air Inhalation	Central tendency	1.43E07	1.28E04	1.16E−07
				High-end	6.80E04	2.47E05	6.06E−07
			Drinking Water Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A
			Fish Ingestion	Central tendency	N/A	N/A	N/A
				High-end	N/A	N/A	N/A

[a] The risk estimates shown in this table for ambient air inhalation are based on modeling of TRI release data using AERMOD as a standalone model where available. For OESs for which there were no TRI-reported releases, risk estimates calculated based on modeling of NEI release data using AERMOD as a standalone model are presented.
[b] For ambient air inhalation risks, central tendency and high-end refer to risks calculated at the 50th and 95th exposure concentrations, respectively.
[c] The risk estimates shown in this table for ambient air inhalation show the maximum 50th percentile (central tendency) and 95th percentile (high-end) value per OES based on either TRI or NEI releases (see note above) for the area distance of 100 to 1,000 m from the release location. The distance range shown in parentheses corresponds to distances where risk is exceeding either 1×10^{-6}, 1×10^{-5}, or 1×10^{-4}, as noted in the individual cells.
[d] The risk estimates shown in for this OES are based on reported TRI release data.
[e] The risk estimates shown in for this OES are based on reported NEI release data.
[f] The risk estimates shown in for this OES are based on EPA-estimated releases for generic facilities/sites.
[g] Risk estimates for drinking water exposures are reflected as central tendency = adult exposures and high-end = infant exposures
[h] Risk estimates for fish ingestion are reflected as central tendency = adult exposures and high-end = 1 to 2-year-old exposures. For POTWs high-end risk is reflected in exposures from releases on Tribal lands and Tribal ingestion rates of fish.
[i] See Section 5.3.8.2 for a population analysis.
N/A= not assessed. For drinking water: only facilities and corresponding COUs that were upstream of a drinking water intake location were assessed for drinking water exposures. For fish ingestion: COUs with the largest releases and highest surface water concentrations were included in a screening assessment. Ingestion of fish from these surface waters did not result in risk below benchmark. Therefore, other facilities with discharges resulting in lower surface water concentrations were also presumed to have estimated fish ingestion exposures that would not result in risk below benchmark. For ambient air: a concentration of 0 was calculated and therefore a risk could not be estimated.

5.3.7 Risk Characterization of Aggregate and Sentinel Exposures

As stated in Section 5.1.4, EPA considered sentinel exposures by considering risks to populations who may have upper bound exposures; for example, workers who perform activities with 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 reasonably available, EPA typically uses the 95th percentile value of the reasonably available dataset to characterize high-end exposure for a given COU. In cases where sentinel exposures result in MOEs exceeding the benchmark or cancer risk lower than the benchmark (*i.e.*, risks were not identified), EPA did no further analysis because sentinel exposures represent the worst-case scenario.

EPA aggregated ambient air concentrations to estimate inhalation risks from co-located facilities (see Sections 5.1.4). The Agency did not consider aggregate inhalation exposures to people who both work at and live near facilities releasing 1,2-dichloroethane because EPA does not have data showing that this is a likely exposure scenario.

5.3.8 Overall Confidence and Uncertainties in Human Health Risk Characterization

5.3.8.1 Occupational Risk Estimates

Occupational Exposure

Manufacture of 1,2-Dichloroethane: Manufacturing processes only occur in closed systems. Empirical inhalation monitoring data for 1,1-dichloroethane were collected via a TSCA section 4 test order from five manufacturing facilities that followed an EPA-approved study plan. The Agency's Exposure groups were identified and monitored. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in Table 5-2. A total of 162 samples were collected among the 5 exposure groups. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group including ONUs. The Agency estimates the number of potential days of worker exposure as up to 250 days/year. The weight of scientific evidence was rated as robust for assessment of inhalation exposure. Due to this high confidence, central tendency and high-end exposures are applicable for assessment of non-cancer (*i.e.*, acute, intermediate and chronic) and cancer inhalation risks. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures. They are also not expected to have dermal exposures due to limited contact with liquids or solids.

Data were available in the test order summary report on PPE used at the monitored facilities as provided in Section 5.3.3. For respiratory protection, operators were described as wearing half- or full-face, air-purifying respirators of varying types during sample collection tasks (open or closed loop), and full-face respirators of varying types during other tasks with exposure potential such as process leak response activities and filling totes. Maintenance technicians were described as wearing full-face airline respirators during major maintenance tasks (*e.g.*, line breaks and other equipment openings). Logistics technicians were described as wearing half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks. Certain laboratory personnel were described as wearing full-face air purifying respirators during disposal of hazardous wastes from fume hoods. ONUs were not reported to wear respiratory protection during any routine daily tasks aside from one case where a supervisor donned a full-face respirator to observe 1,2-dichloroethane loading activities from approximately 20 feet away.

Byproducts Produced During the Manufacture of 1,2-Dichloroethane: Manufacturing processes only occur in closed systems. EPA assessed occupational exposures to 1,1-dichloroethane, trichloroethylene, perchloroethylene, methylene chloride (CASRN 75-09-2), and carbon tetrachloride (CASRN 56-23-5) produced as byproducts during the manufacture of 1,2-dichloroethane. EPA used two methods to estimate inhalation exposure. The first method applied to 1,1-dichloroethane where EPA received empirical inhalation monitoring data via a TSCA section 4 test order for 1,1-dichloroethane produced as a byproduct during manufacture of 1,2-dichloroethane. The second method applied to the other four byproduct chemicals where EPA received monitoring data via a TSCA section 4 test order for 1,2-dichloroethane. These data were then used as a surrogate, adjusting for differences in vapor pressure and mole fraction, to estimate inhalation exposures to the byproducts.

The inhalation monitoring data EPA received for 1,1-dichloroethane via test order followed an EPA approved study plan. Exposure groups were identified and monitored. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in the Manufacturing OES of Table 5-2. A total of 98 samples were collected among the five exposure groups. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group including ONUs. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. The weight of scientific evidence was rated as robust for assessment of inhalation exposure. Due to this high confidence, central tendency and high-end exposures are applicable for assessment of non-cancer (*i.e.,* acute, intermediate and chronic) and cancer risks for workers and ONUs. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures. They are also not expected to have dermal exposures due to limited contact with liquids or solids.

The inhalation monitoring data EPA received for 1,2-dichloroethane via test order followed an EPA-approved study plan and is described above in the preceding *Manufacture of 1,2-Dichloroethane* section. These data were used as surrogate data to estimate inhalation exposures to the other four byproduct chemicals. The byproducts are in process streams separated from the main 1,2-dichloroethane product stream during the purification steps. EPA received data on the weight percent of the byproduct chemicals in these processes. These data enabled the Agency to adjust the 1,2-dichloroethane by differences in vapor pressure and mole fraction to estimate inhalation exposure to the byproduct chemicals. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for both workers and ONUs. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. The weight of scientific evidence was rated as moderate for assessment of inhalation exposure. The high-end estimates combined both highest 1,2-dichloroethane exposure and highest byproduct weight percent and may be overly conservative for assessment of chronic risks for workers and ONUs. The method and confidence support the use of high-end exposures for assessment of non-cancer acute and intermediate risks and the central tendency for the assessment of non-cancer chronic and cancer risks for the other four byproduct chemicals. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures and are not expected to have dermal exposures through contact with liquids or solids.

Data were available in the test order summary report on PPE used at the monitored facilities as provided in Section 5.3.3 and summarized above for Manufacture.

Repackaging: Descriptions of worker activities during repackaging are provided in Table 5-2. Empirical inhalation monitoring data for 1,2-dichloroethane were available from one study from 1976 for workers engaged in drum filling. Information on exposure groups monitored was not available. Discrete samples were not available, and EPA used the reported maximum concentration as the high-end exposure and the reported arithmetic mean as the central tendency. Due to the limited monitoring data available, the Agency also used modeling to estimate exposures. EPA's July 2022 Chemical Repackaging Generic Scenario provides approaches to estimate inhalation exposure for worker activities during repackaging. The Agency modeled inhalation exposure using these approaches with Monte Carlo simulation to estimate 50th percentile (central tendency) and 95th percentile (high-end) exposures. Strengths of the modeling include the generic scenario as the foundation and the use of Monte Carlo. A key uncertainty is the lack of 1,2-dichloroethane-specific information on the daily and yearly throughput of 1,2-dichloroethane at repackaging sites, which impacts the levels of 1,2-dichloroethane inhalation exposure. Overall, EPA rated the weight of scientific evidence as slight to moderate.

EPA estimates the number of potential days of worker exposure as up to 250 days/yr. Due to the age of the data and uncertain applicability to current 1,2-dichloroethane repackaging processes, it is not recommended that the monitoring data results be used for risk determination. The modeling results have higher confidence than the monitoring data and are applicable for assessing acute and intermediate risks. There is uncertainty that a worker would be exposed to the high-end value daily throughout the year so the central tendency value from the modeling is more appropriate for the assessment of non-cancer chronic and cancer risks. The central tendency from the worker modeling results is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids.

Some information on PPE was available from the Chemical Repackaging GS, indicating potential use of safety glasses, face shields, aprons, and gloves (see Table 5-20).

Processing as a Reactant: 1,2-Dichloroethane is processed as a reactant in the manufacture of other chemicals. Empirical inhalation monitoring data for 1,2 dichloroethane were collected via a TSCA section 4 test order from two facilities that process 1,2-dichloroethane as a reactant following an EPA-approved study plan. Exposure groups were identified and monitored. Workers were categorized into exposure groups of operators, logistics technicians, maintenance technicians, laboratory technicians and ONUs. Within an exposure group, workers perform similar tasks. More details on the exposure groups are provided in Table 5-2. A total of 62 samples were collected among the 5 exposure groups. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for each exposure group. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. The weight of scientific evidence was rated as robust for assessment of inhalation exposure. Due to this high confidence, central tendency and high-end exposures are applicable for assessment of non-cancer acute, intermediate and chronic and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

Data was available in the test order summary report on PPE used at the monitored facilities as provided in Section 5.3.3. For respiratory protection, operators wore half- or full-face, air-purifying respirators of varying types during sample collection tasks (open or closed loop), and full-face respirators of varying types during other tasks with exposure potential such as process leak response activities and filling totes. Maintenance technicians wore full-face airline respirators during major maintenance tasks (*e.g.*, line breaks and other equipment openings). Logistics technicians wore half-face or full-face respirators during loading or offloading tasks which required connecting and disconnecting process lines to railcars, tanks, and trucks. Certain laboratory personnel wore full-face air purifying respirators during disposal of hazardous wastes from fume hoods. ONUs were not reported to wear respiratory protection during any routine daily tasks aside from one case where a supervisor donned a full-face respirator to observe 1,2-dichloroethane loading activities from approximately 20 feet away.

Processing into Formulation, Mixture or Reaction Product: EPA used inhalation data provided via a test order submission, which was existing data generated during the manufacture of a herbicide used worldwide where the 1,2-dichloroethane is used as a processing solvent (BASF, 2021). This was existing data that the submitter had collected and had available when the test order was received. The similar exposure groups monitored are not available. That study contained 112 worker personal sample data points and 16 ONU personal sample data points. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers and ONUs, respectively. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. Information on worker activities for this OES is provided in Table 5-2. The weight of scientific evidence was rated as moderate for assessment of inhalation exposure. Due to this high confidence, both central tendency and high-end exposures are applicable for assessment of non-cancer (*i.e.,* acute, intermediate and chronic) and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

Some information on PPE was available from the ESD on Adhesive Formulation, indicating potential use of gloves and safety glasses with side shields or goggles (see Table 5-20).

Industrial Application of Adhesives and Sealants: This OES is a broad category and EPA did not identify any data to more specifically define this OES. The Agency did not identify any 1,2-dichloroethane inhalation monitoring data for this OES. Empirical data on inhalation exposure was available for trichloroethylene for this OES. Trichloroethylene has a vapor pressure similar to 1,2-dichloroethane and the data was included in the published risk evaluation. The TCE monitoring data were obtained from a NIOSH Health Hazard Evaluation report (HHEs) and three OSHA facility inspections (OSHA, 2017; Chrostek, 1981). These data encompass exposures from facilities using TCE in adhesive and coating applications. The data includes 22 samples for workers and 2 samples for ONUs. EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers and ONUs. Information on worker activities for this OES is provided in Table 5-2. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. The weight of scientific evidence was rated as moderate for this OES for assessment of inhalation exposure. The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute and intermediate risk and the central tendency for the assessment of chronic and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

Some information on PPE was available from the ESD on the Use of Adhesives, indicating potential use of gloves and safety glasses or goggles, and sometimes respirators (see Table 5-20).

Industrial Application of Lubricants: This OES is a broad category and EPA did not identify any data to more specifically define this OES for 1,2-dichloroethane. The Agency did not identify any empirical inhalation monitoring data that could be used for this OES. Therefore, EPA used a modeling approach to estimate inhalation exposures.

The EPA/OPPT Brake Servicing Model was used, which also has been used in other risk evaluations. This model uses a near-field/far-field modeling approach with Monte Carlo to estimate exposure concentrations in the near-field for the worker and the far-field for the ONU. The model uses data from CARB to estimate the number of spray applications of lubricant per brake job and the number and duration of brake servicing jobs completed per day at a shop by a worker. The weight fraction of 1,2-dichloroethane in the brake lubricant is an important chemical-specific parameter that impacts the magnitude of inhalation exposure. The higher the 1,2-dichloroethane concentration, the higher the amount of 1,2-dichloroethane that is volatilized that the worker could be exposed to. EPA used 1,2-dichloroethane data to estimate a range of 5 to 10 percent for the 1,2-dichloroethane weight percent in the brake lubricant.

EPA estimates the number of potential days of worker exposure as up to 250 days/yr. Information on worker activities for this OES is provided in Table 5-2. The weight of scientific evidence was rated as slight to moderate for this OES for assessment of inhalation exposure. The information on 1,2-dichloroethane for this OES, modeling, and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute and intermediate risk as well as the central tendency for the assessment of chronic and cancer risks. The central tendency from the worker modeling results is a more representative and appropriate exposure estimate for a frequent, repeated inhalation exposure (*i.e.*, chronic) for the ONU exposure group. ONUs do not directly handle the chemical and are therefore expected to have lower inhalation exposures. They are also not expected to have dermal exposures due to limited contact with liquids or solids.

No information from EPA GS/Emission Scenario Documents and NIOSH HHEs on Inhalation PPE was found for this OES.

Industrial and Commercial Non-Aerosol Cleaning and Degreasing: This OES is a broad category and EPA did not identify any data to more specifically define this OES for 1,2-dichloroethane.

EPA did not identify any empirical inhalation monitoring data for 1,2-dichloroethane that could be used for the assessment of inhalation exposure for this OES. Empirical data on inhalation exposure was available for trichloroethane for this OES. EPA used surrogate data from TCE during batch open-top vapor degreasing. Batch open-top vapor degreasing was the non-aerosol cleaning and degreasing method chosen for this assessment because it has the highest exposure potential of the possible cleaning and degreasing methods for which 1,2-dichloroethane may be used. TCE was chosen as surrogate due to its very similar vapor pressure of 73.5 mm Hg vs. 78.9 mm Hg for 1,2-dichloroethane; therefore, potential exposures are expected to be similar for the same activity. TCE also has a robust data set, with 113 samples for workers and 10 samples for ONUs.

The TCE monitoring data were obtained from NIOSH HHEs. These data encompass exposures from various industries, such as metal tube production, valve manufacturing, jet and rocket engine manufacturing, air conditioning preparation and assembly, and air conditioning motor parts, for workers and 10 samples for ONUs.

EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers and ONUs. Information on worker activities for this OES are provided in Table 5-2. EPA estimates the number of potential days of worker exposure as up to 250 days/yr. The weight of scientific evidence was rated as slight to moderate for this OES for assessment of inhalation exposure. The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute and intermediate risk as well as the central tendency for the assessment of chronic and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

Some information on PPE was available from the ESD on the Use of Vapor Degreasers and various

NIOSH HHEs, indicating potential use of gloves and/or respirators – see Table 5-20.

Industrial and Commercial Aerosol Product: This OES is a broad category and EPA did not identify any data to more specifically define this OES for 1,2-dichloroethane. The Agency did not identify any empirical inhalation monitoring data that could be used for this OES. Therefore, EPA used a modeling approach to estimate inhalation exposures.

The EPA/OPPT Brake Servicing Model was also used for this OES. As described above for *Industrial Application of Lubricants*, this model uses a near-field/far-field modeling approach with Monte Carlo to estimate exposure concentrations in the near-field for the worker and the far-field for the ONU. The model uses data from CARB to estimate the number of spray applications of lubricant per brake job and the number and duration of brake servicing jobs completed per day at a shop by a worker. The weight fraction of 1,2-dichloroethane in the brake lubricant is an important chemical-specific parameter that impacts the magnitude of inhalation exposure. The higher the 1,2-dichloroethane concentration, the higher the amount of 1,2-dichloroethane that is volatilized to which the worker could be exposed. EPA used 1,2-dichloroethane data to estimate a range of 90 to 100 percent for the 1,2-dichloroethane weight percent in the brake lubricant.

EPA estimates the number of potential days of worker exposure as up to 250 days/yr. Information on worker activities is provided in Table 5-2. The weight of scientific evidence was rated as slight for this OES for assessment of inhalation exposure. The information on 1,2-dichloroethane for this OES and the associated confidence do not support the use of the central tendency and high-end exposures for assessment of non-cancer acute, intermediate, and chronic and cancer risks. ONUs do not directly handle the chemical and are not expected to have dermal exposures through contact with liquids or solids.

No information from EPA Generic Scenarios/Emission Scenario Documents or NIOSH HHEs on Inhalation PPE for this OES were found.

Commercial Lab: Empirical data on inhalation exposure for 1,2-dichloroethane were provided via a test order submission from Vinyl Institute, which includes manufacturers and processors of 1,2-dichloroethane. The sampling was done following an EPA-approved study plan. Within this dataset for manufacturers, EPA identified 29 worker full-shift PBZ samples for laboratory technicians. These laboratory technicians conducted routine daily tasks such as preparing samples for analysis, preparing chemical solutions or standards, cleaning laboratoryequipment and glassware, and data input, interpretation, and analysis. Disposal of gas chromatography (GC) waste was reported to occur on a weekly basis, and sample analyses varied in frequency (daily, weekly, monthly, or as needed).

EPA used the monitoring data to estimate the 50th percentile as central tendency and the 95th percentile as the high-end exposures for workers. EPA did not identify any ONU PBZ samples. Therefore, the Agency used the central tendency from workers to represent ONU exposures and ONUs. Worker activity information is provided in Table 5-2. EPA estimates the number of potential days of worker exposure for this OES as up to 250 days/yr. The weight of scientific evidence was rated as moderate for this OES for assessment of inhalation exposure. The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute, intermediate, and chronic and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

Data was available in the test order summary report on PPE used at the monitored facilities as provided in Section 5.3.3, including PPE worn by laboratory personnel. Certain laboratory personnel wore full-face, air purifying respirators during disposal of hazardous wastes from fume hoods.

Some information on PPE was available from the Use of Laboratory Chemicals GS, indicating potential use of gloves, face shields, goggles, and respirators (see Table 5-20).

Waste Handling, Treatment, and Disposal – Landfill: EPA did not identify any PBZ monitoring data but did identify area monitoring data for 1,2-dichloroethane from a landfill study in Greece, which included a total of12 samples. The landfill receives both municipal and industrial waste. Samples were collected at three locations at the landfill facility, two locations (8 samples total) were in the landfill area itself, and one location (4 samples) was near the landfill boundaries. Worker activity information is provided in Table 5-2. There is uncertainty in the use of area monitoring data for estimating exposure where information on worker activities is lacking and whether the data is representative of exposure concentrations the worker would receive.

From these monitoring data, EPA calculated the 50th and 95th percentile 8-hour TWA concentrations to estimate a central tendency and high-end estimate of potential occupational inhalation exposures, respectively, for landfill sites. EPA estimates the number of potential days of worker exposure for this OES as up to 250 days/yr. The weight of scientific evidence was rated as slight for this OES for assessment of inhalation exposure. The data and confidence do not support the use of the central tendency and high-end exposures for assessment of non-cancer acute, intermediate and chronic and cancer risks. ONUs do not directly handle the chemical and are not expected to have dermal exposures through contact with liquids or solids.

No information from EPA Generic Scenarios/Emission Scenario Documents and NIOSH HHEs on Inhalation PPE was found for this OES.

Waste Handling, Treatment, and Disposal – WWT: EPA did identify 1,2-dichloroethane PBZ monitoring data from a study at an activated sludge biological treatment plant in Finland, which included summary statistics based on 18 PBZ samples. Samples were collected for workers in the trash raking room where a debris removal system operates, sand separation pond where heavy particles are separated from the wastewater, and sludge dewatering area where water content is reduced from the sludge. More specific worker activities were not described. Due to the lack of discrete values, EPA used the average of the arithmetic means reported in the study to represent central tendency and the maximum value reported in the study for high-end exposure. No PBZ samples for ONU exposures were identified for either landfills or WWT facilities. Therefore, EPA used the central tendency from workers to represent ONU exposures.

EPA estimates the number of potential days of worker exposure for this OES as up to 250 days/yr. Information on worker activities for this OES is provided in Table 5-2. The weight of scientific evidence was rated as moderate for this OES for assessment of inhalation exposure. The data and confidence support the use of the central tendency and high-end exposures for assessment of non-cancer acute, intermediate, and chronic and cancer risks. ONUs do not directly handle the chemical and are therefore not expected to have dermal exposures through contact with liquids or solids.

No information from EPA Generic Scenarios/Emission Scenario Documents and NIOSH HHEs on Inhalation PPE was found for this OES.

Occupational Dermal Exposure

The dermal exposure assessment used the DEVL Model to estimate dermal exposures. A key strength of the approach used was the use of data on fractional absorption that was developed from a TSCA section 4 test order for 1,2-dichloroethane. Because 1,2-dichloroethane is a highly volatile chemical, any estimate of dermal exposure must take volatility into account. The fraction absorbed value from the test order showed a small percentage absorbed to the skin (0.3%) with the majority (99.7%) evaporating. This enabled EPA to generate a more accurate estimate of dose (Labcorp Early Development, 2024).

The dermal loading values (mg/cm^2) used for the DEVL Model are based on experimental studies. However, EPA does not know if the experimental values are applicable for exposure scenarios that are encountered in the industrial and commercial settings for the COU/OES identified for 1,2-dichloroethane. The modeling approach does include a weight fraction parameter that accounts for differences in the weight fraction of 1,2-dichloroethane between OESs. However, it does not account for other differences that may exist among the OESs that impact dermal exposure such as differences in dermal loading, skin surface area exposed, and frequency of contact. The weight of scientific evidence was rated as moderate for the method use to assess dermal exposure for the COU/OES of 1,2-dichloroethane.

Closed-System COUs: The COUs of Manufacturing of 1,2-dichloroethane and Processing as a reactant take place in closed-systems at manufacturing facilities. The test order inhalation monitoring data supports that there is still the potential for dermal exposure during activities such as connecting/disconnecting transfer lines and sampling. These types of activities can be done daily although the fraction of the workers' shift associated with these activities is expected to be low. While high-end dermal exposures are possible during these types of activities (*i.e.*, acute and/or intermediate exposure), high-end dermal exposures are likely to be infrequent. EPA believes the central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic) and is health protective for risk estimation for closed system processes, as daily high-end exposures from connecting/disconnecting of transfer lines and sampling is not realistic. Both the central tendency and high-end dermal exposure estimates can be used for the assessment of acute and intermediate risks.

COUs Not Currently Assessed as Closed-Systems: For the other COUs assessed for 1,2-dichloroethane, EPA has uncertainty whether designation as closed-system is applicable as they may involve use of open systems and greater worker involvement with additional worker activities and the possibility of multiple contact events per day. The possibility of increased exposure potential compared to closed-system COUs supports the use of both the central tendency and the high-end dermal exposures for assessment of acute, intermediate and chronic risks.

Data was available from the test order summary report for the manufacturing facilities monitored that indicated standard dermal PPE for production process areas included neoprene gloves and leather or cut-resistant gloves, while task-specific PPE in this area may include nitrile gloves or viton/butyl gloves. For logistic work areas, neoprene gloves were standard and task-specific PPE may include heavy duty nitrile gloves. Nitrile gloves are standard PPE for laboratory work areas.

5.3.8.2 General Population Risk Estimates

General Population: Air Pathway

For the ambient air pathway, EPA provides an OES-specific risk characterization that is based on the lines of evidence available for each OES (Table 5-35). This section also provides overarching characterizations of each line of evidence that feed into the OES-specific characterization. Across all

OESs, EPA relied on and has robust confidence in the non-cancer and cancer inhalation hazard values that are based on the weight of scientific evidence across a number of studies.

1,2-Dichloroethane ambient air concentrations were estimated using either facility release data reported in TRI and NEI corresponding to TSCA COU or EPA-estimated releases for generic facilities/sites (see Table 5-34 for the data sources available for each OES). The Agency performed a multi-year analysis using AERMOD to estimate exposure concentrations at various distances from a releasing facility. Additionally, EPA used HEM to characterize populations living near releasing facilities (see Sections 5.1.3.1 and 5.1.3.4 for additional information).

The population analysis performed using HEM is based on the centroids of census blocks. HEM does not provide population distribution within a census block and individuals within a census may live closer to or farther from the 1,2-dichloroethane-releasing facility than the centroid. Additionally, the current population analysis does not account for future residential land use changes and population shifts. For a small subset of facilities that were not modeled in HEM and had risk estimates above 1×10^{-6} at an area distance of 100 to 1,000 m, EPA characterized population via manual analysis of satellite imagery. Overall, EPA has moderate confidence that the population analysis performed in this evaluation has captured populations living nearest to releasing facilities that are exposed to ambient air concentrations of 1,2-dichloroethane that would result in risk above 1×10^{-6}.

Overall, EPA has robust confidence in risk estimates that were calculated using release data reported to both TRI and NEI, and that the risks are representative of actual exposures to the general population living near releasing facilities. The robust confidence is based on high levels of confidence in underlying release information used to estimate exposures, the completeness of the datasets modeled, and the modeling methods used. The multi-year analysis using AERMOD for NEI and TRI data provides a complete and robust dataset. The use of HEM allowed for the characterization of populations living near facilities and provided strong evidence for distances that are most relevant for general population exposure.

Overall, EPA has moderate confidence in risk estimates that were calculated using release data reported to NEI only. The moderate confidence is based on high levels of confidence in underlying release information used to estimate exposures, the robust confidence in the NEI-reported releases, and the modeling methods used. The major uncertainty is the lack of population data; however, for the one OES where there were cancer risk estimates that exceeded 1×10^{-6} at a modeled distance exceeding 100 m (Industrial application of adhesives and sealants), EPA was able to use satellite images to visually assess that there was not general population exposure within 1,000 m of the facility point-source releases. For OESs where cancer risk estimates exceeded 1×10^{-6} at 100 m but not 1,000 m, there is uncertainty in risk estimates between the two distances modeled. For example, if risk was found at 100 m and not at 1,000 m, EPA is uncertain if there is risk at distances between 101 and 999 m.

Additionally, overall, the Agency has slight confidence in risk estimates that relied on EPA-estimated releases from generic facilities/sites; however, there was only one OES (Commercial aerosol products) for which EPA relied solely on estimated releases from generic facilities/sites. Although EPA has robust confidence in the methodology used to calculate ambient air concentrations, the uncertainties in release estimates and lack of site-specific data resulted in overall slight confidence in the risk estimates. For OESs where the Agency had facility-reported releases and EPA-estimated releases for generic facilities/site, the Agency preferred risks calculated using reported releases due to the uncertainties associated with the estimated releases.

Table 5-35. Overall Confidences in General Population Inhalation Risk Estimates for Each OES

OES	Data Source	Overall Confidence
Manufacturing	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM and AERMOD. The use of both NEI and TRI databases provides robust confidence that EPA captured all releases across the years assessed in this evaluation. A comparison using facility total emissions from both databases shows that they result in similar risk estimates. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this draft risk evaluation and OES because of the larger number of release years that were modeled. The use of HEM to model risks at census block centroids for only 1 year of release data from TRI provides robust confidence that use of risk estimates at distances of 100 to 2,500 m is appropriate because as there are populations living at those distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Repackaging	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM and AERMOD. The use of both NEI and TRI databases provides robust confidence that EPA captured all releases across the years assessed in this evaluation. A comparison using facility total emissions from both databases shows that they result in similar risk estimates. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this draft risk evaluation and OES because of the larger number of release years that were modeled. The use HEM to model risks at census block centroids for only 1 year of release data from TRI provides robust confidence that use of risk estimates at distances of 100 to 2,500 m is appropriate because there are populations living at those distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Processing as a reactant	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM and AERMOD. The use of both NEI and TRI databases provides robust confidence that EPA captured all releases across the years assessed in this evaluation. A comparison using facility total emissions from both databases shows that they result in similar risk estimates. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this draft risk evaluation and OES because of the larger number of release years that were modeled. The use HEM to model risks at census block centroids for only 1 year of release data from TRI provides robust confidence that use of risk estimates at distances of 100 to 2,500 m is appropriate because there are populations living at those distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Processing into formulation, mixture, or reaction product	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM and AERMOD. The use of both NEI and TRI databases provides robust confidence that EPA captured all releases across the years assessed in this evaluation. A comparison using facility total emissions from both databases shows that they result in similar risk estimates. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this draft risk evaluation and OES because of the larger number of release years that were modeled. The use HEM to model risks at census block centroids for only 1

OES	Data Source	Overall Confidence
Processing into formulation, mixture, or reaction product *(continued)*	TRI and NEI *(continued)*	year of release data from TRI provides robust confidence that use of risk estimates at distances of 100 to 2,500 m is appropriate because there are populations living at those distances. Based on the overall weight of evidence, EPA has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Industrial application of adhesives and sealants	NEI- and EPA-estimated releases	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only two NEI reporting years for those assessed in this evaluation, EPA did not have release data for each year assessed. Also, AERMOD does not provide population information. At the 95th percentile, two facilities had cancer risk estimates above 1×10^{-6} at an area distance of 100 to 1,000 m (neither facility showed non-cancer risk estimates below the benchmarks beyond 10 m). For both facilities, EPA determined that there is no general population living within 1,000 m of the modeled release location by visualization of satellite images. No other facilities had either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at a modeled distance beyond 100 m. EPA did not run HEM for this OES because of the limited number of facilities that showed risk at relevant distances based on the modeling done using AERMOD. Based the rationale developed in the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities* (U.S. EPA, 2022c), EPA has moderate confidence that there are no members of the general population living within 100 m release sites. Additionally, due to the limited number of facility-reported releases, the Agency calculated risk estimates for EPA-estimated releases from generic sites/facilities. Due to the uncertainties in these releases, EPA has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates calculated using facility-reported releases and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Industrial application of lubricants and greases	NEI	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, EPA did not have release data for each year assessed. EPA did not find either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at any modeled distance, with 10 m from the release point being the smallest distance modeled. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Commercial aerosol products	EPA estimated releases	For this OES, there were no facility-reported releases and EPA relied on estimated releases from generic facilities/sites to estimate general population inhalation risks. The Agency used AERMOD and assumed physical characteristics (*e.g.*, stack height, stack diameter, exit temperature, etc.) and site characteristics (*e.g.*, meteorology station and land use) for inputs to the model. EPA found cancer risk estimates exceeding 1×10^{-6} at

OES	Data Source	Overall Confidence
Commercial aerosol products *(continued)*	EPA estimated releases *(continued)*	a modeled distance up to 100 m. However, the Agency has slight confidence in the accuracy of the risk estimates due to uncertainties in the inputs to AERMOD, the uncertainties associated with the release estimates, and the lack of population data for generic facilities/sites.
Non-aerosol cleaning and degreasing	TRI, NEI, and EPA estimated releases	For this OES, EPA modeled facility-reported releases from TRI-, NEI-, and EPA-estimated releases for generic facilities/sites using AERMOD and HEM. For this OES EPA is deferring to risk estimates made using releases reported to NEI because only 1 facility in this OES reported to TRI. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, EPA did not have release data for each year assessed. Also, AERMOD does not provide population information. No facilities had either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at a modeled distance beyond 100 m. Based on the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities* (U.S. EPA, 2022c), EPA has moderate confidence that there are no members of the general population living within 100 m release sites. Additionally, due to the limited number of facility-reported releases, the Agemcy calculated risk estimates for EPA-estimated releases from generic sites/facilities. Due to the uncertainties in these releases, the Agency has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates calculated using facility-reported releases and that the risks are representative of actual exposures to the general population living near releasing facilities.
Laboratory use	NEI- and EPA-estimated releases	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, the Agency did not have release data for each year assessed. Also, AERMOD does not provide population information. No facilities had either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at a modeled distance beyond 100 m. Based on the rationale developed in the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities* (U.S. EPA, 2022c), EPA has moderate confidence that there are no members of the general population living within 100 m release sites. Additionally, due to the limited number of facility-reported releases, the Agency calculated risk estimates for EPA-estimated releases from generic sites/facilities. Due to the uncertainties in these releases, EPA has slight confidence in the accuracy of the risk estimates for generic facilities/sites and is relying on risks calculated using facility-reported releases; however, the estimated risks from the generic/facilities likely represent high-end estimations. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates calculated using facility-reported releases and that the risks are representative of actual exposures to the general population living near releasing facilities.

OES	Data Source	Overall Confidence
Waste handling, treatment, and disposal (incinerator)	TRI and NEI	For this OES, EPA modeled facility-reported releases from TRI and NEI using both HEM and AERMOD. The use of both NEI and TRI databases provides robust confidence that EPA captured all releases across the years assessed in this evaluation. A comparison using facility total emissions from both databases shows that they result in similar risk estimates. Although both NEI and TRI both provide high-quality data, EPA is deferring to risk estimates calculated using TRI-reported releases for this draft risk evaluation and OES because of the larger number of release years that were modeled. The use of HEM to model risks at census block centroids for only 1 year of release data from TRI provides robust confidence that use of risk estimates at distances of 100 to 2,500 m is appropriate, as there are populations living at those distances. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Waste handling, treatment, and disposal (landfill)	NEI	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, EPA did not have release data for each year assessed. No facilities had either cancer risk estimates exceeding 1×10^{-6} or non-cancer risk estimates below the relevant benchmarks at a modeled distance beyond 100 m. Based on the rationale developed in the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities* (U.S. EPA, 2022c), EPA has moderate confidence that there are no members of the general population living within 100 m release sites. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates.
Waste handling, treatment, and disposal (non-POTW WWT)	NEI	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that the Agency captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, EPA did not have release data for each year assessed. At the 95th percentile, one facility had cancer risk estimates above 1×10^{-6} at an area distance of 100 to 1,000 m. For this facility, EPA determined that there is no general population living within 1,000 m of the modeled release location by visualization of satellite images. EPA did not run HEM for this OES because of the limited number of facilities that showed risk at relevant distances based on the modeling done using AERMOD. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.
Waste handling, treatment, and disposal (POTW)	NEI	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, the Agency did not have release data for each year assessed. EPA calculated cancer risk estimates above 1×10^{-6} at a distance of 100 to 1,000 m for one facility. A visual inspection using satellite images shows that general populations live within approximately 50 m of the modeled release location. Based on the overall weight of evidence, the Agency has moderate confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.

OES	Data Source	Overall Confidence
Waste handling, treatment, and disposal (remediation)	NEI	For this OES, EPA modeled facility-reported releases from NEI- and EPA-estimated releases for generic facilities/sites using AERMOD. The use of the NEI database provides robust confidence that EPA captured all releases; however, since there were only 2 NEI reporting years for those assessed in this evaluation, the Agency did not have release data for each year assessed. No facilities had cancer or non-cancer risk estimates exceeding 1×10^{-6} at a modeled distance beyond 100 m. Based on the rationale developed in the *Draft TSCA Screening Level Approach for Assessing Ambient Air and Water Exposures to Fenceline Communities* (U.S. EPA, 2022c), EPA has moderate confidence that there are no members of the general population living within 100 m release sites. Based on the overall weight of evidence, the Agency has robust confidence in the risk estimates and that the estimated risks are representative of actual exposures to the general population living near releasing facilities.

Other General Population Exposure Pathways

EPA quantitatively assessed general population exposures to 1,2-dichloroethane based on the reported facility-specific releases to surface waters and soil. High-end estimates of drinking water intake, fish ingestion, as well as incidental ingestion via swimming and pica of soil are based on EPA's *Exposure Factors Handbook* (U.S. EPA, 2011a). These estimates represent exposures to people who consume more drinking water, fish or soil. Estimated risks based on high-end exposures did not result in non-cancer risks below the benchmark for all these pathways, namely—drinking water exposures, fish ingestion, incidental oral ingestion from swimming or soil as well as dermal exposures from swimming.

Across all OESs, EPA relied on and has robust confidence in the non-cancer and cancer oral hazard values that are based on the weight of scientific evidence across a number of studies. The Agency has robust confident in the conservative high-end exposure estimates (see Sections 5.1.3.2 and 5.1.3.3) because they are based on reported facility-specific release data and has robust confidence in the non-cancer risk estimates below the benchmark for the assessed pathways. EPA also has robust confidence that the risk estimates resulting from the high-end exposures are protective of various life stages, PESS, and Tribal nations with higher fish consumption.

5.3.8.3 Consumer Risk Estimates

EPA identified three imported articles that showed evidence of 1,2-dichloroethane emissions and potential exposures to consumers: squishy toys, Christmas ornaments, and molded plastic figures and lamp bases. As presented in Section 5.3.5 above and the *Draft Consumer Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q), the Agency used conservative assumptions in terms of duration and frequency of exposures such as mouthing and dermal handling of toys and ornaments used as toys by children as well as inhalation exposures for adults as bystanders of emissions from these articles. EPA has robust confidence that these conservative assumptions represent high-end exposure scenarios for both children and adults and that the non-cancer risk estimates (see Table 5-28) below benchmark are protective of children's exposures to 1,2-dichloroethane. Cancer was not assessed as the decay of 1,2-dichloroethane emissions from these articles would not result in lifetime exposures.

Consumer Exposure

EPA assessed exposures to consumers from articles that were identified through peer-reviewed literature as emitting 1,2-dichloroethane. The number of articles were limited in terms of an identified lamp base but were broader for a series of Christmas ornaments and children's squishy toys—all of which were imported from China. EPA used conservative assumptions in terms of duration and frequency of exposures such as mouthing and dermal handling of toys and ornaments used as toys by children as well as inhalation exposures for adults as bystanders of emissions from these articles. The Agency has robust confidence in and based risk estimates on the oral, dermal, and inhalation non-cancer hazard values. Lastly, EPA has robust confidence that these conservative assumptions represent high-end exposure scenarios for both children and adults and that the non-cancer risk estimates below benchmark are protective of children's exposures to 1,2-dichloroethane.

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 non-risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified by the Agency as relevant to the risk evaluation, under the conditions of use (COUs). 1,2-Dichloroethane is a highly volatile organic compound mainly used to manufacture vinyl chloride (CASRN 75-01-4); however, other processing, industrial, and consumer applications do exist and are considered in this draft risk evaluation. EPA is preliminarily determining that 1,2-dichloroethane presents unreasonable risk of injury to human health and the environment. The following COUs significantly contribute to the unreasonable risk: 15 COUs (human health) due to non-cancer and cancer effects from inhalation and dermal exposures to workers and occupational non-users (ONUs); and 2 COUs (the environment) due to chronic effects from exposure to aquatic invertebrates via releases to surface water and sediment. EPA preliminarily did not identify unreasonable risk to consumers or the general population.

This preliminary unreasonable risk determination is based on the information provided in previous sections of this draft risk evaluation, the technical support documents (TSDs), the appendices, and supplemental documents (see Appendix C)—in accordance with TSCA section 6(b). This preliminary 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)).

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 effects under consideration, the reversibility of the health effects being evaluated, exposure-related considerations (*e.g.*, duration, magnitude, frequency of exposure), or population exposed—including populations with greater exposure or greater susceptibility [PESS]) and the confidence in the information used to inform the hazard and exposure values. This draft risk evaluation discusses important assumptions and key sources of uncertainty in the risk characterization, and these are described in more detail in the respective weight of scientific evidence conclusions sections for environmental concentrations (Section 3.3.4), environmental exposures (Section 4.1.1), environmental hazards (Section 4.2.2), as well as human health hazards (Section 5.2.1). It also includes a discussion of overall confidence and remaining uncertainties sections for human health (Section 5.3.7) and environmental risk characterizations (Section 4.3.5). 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. EPA does *not* make unreasonable risk determinations based on slight confidence.

Environment Summary

EPA evaluated risk of injury to the environment due to exposures via soil, air, surface water, and sediment (*e.g.*, reproductive effects to aquatic invertebrates, growth and developmental effects to algae). The Agency is preliminarily determining that the following two COUs significantly contribute to the unreasonable risk of injury to the environment due to chronic exposure to aquatic invertebrates via surface water and sediment:

- Manufacturing – domestic manufacture; and
- Disposal.

Workers and ONUs Summary

EPA evaluated 19 COUs with exposures to workers and ONUs for 1,2-dichloroethane. The Agency is preliminarily determining that 1,2-dichloroethane presents an unreasonable risk of injury to human health due to non-cancer health effects and cancer risk to workers from inhalation and dermal exposures and ONUs from inhalation exposures. Specifically, EPA is preliminarily determining that the following 15 COUs significantly contribute to the unreasonable risk of 1,2-dichloroethane:

- Manufacturing – domestic manufacture;
- Manufacturing – import;
- Processing – repackaging;
- Processing – as a reactant – intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – fuels and fuel additives and all other petroleum and coal products manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – processing aids: specific to petroleum production; plastics material and resin manufacturing;
- Processing – incorporated into a formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing;
- Processing – recycling;
- Industrial use – adhesives and sealants;
- Industrial use – lubricants and greases – solid film lubricants and greases
    - *[Note: no dermal risk found for this COU]*;
- Industrial use – other use – process solvent;
- Industrial use – process regulator – *e.g.* catalyst moderator, oxidation inhibitor;
- Industrial use – solvents (for cleaning and degreasing) – degreasing and cleaning solvents;
- Commercial use – other use – laboratory chemical; and
- Disposal.

Table 5-22 shows that for all occupational COUs with calculated inhalation risk estimates, risk estimates would no longer indicate unreasonable risk (*i.e.*, exceed the benchmark) if respirators that achieve a minimum assigned protection factor (APF) of 10 to 1,000 are used. In making this preliminary unreasonable risk determination, EPA has considered reasonably available information about PPE usage for two COUs: (1) Manufacturing – domestic manufacturing; and (2) Processing as reactant – intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing (see Section 6.2.1). EPA is preliminarily determining that both occupational COUs significantly contribute to unreasonable risk of 1,2-dichloroethane, though workplace controls could be used for some tasks to reduce exposure and risk to a level for both COUs that would not be considered unreasonable. For other occupational COUs (*i.e.*, those not described in the test order submission from the Vinyl Institute (Stantec ChemRisk, 2024)), EPA does not have reasonably available information regarding use of PPE.

EPA did *not* preliminarily identify unreasonable risk of injury to human health of workers or ONUs from the following four COUs:

- Distribution in commerce;
- Industrial use – functional fluids (closed systems) – heat transferring agent;
- Commercial use – plastic and rubber products; and
- Commercial use – fuels and related products.

Consumer Summary
EPA evaluated risk of injury to human health due to non-cancer risk from inhalation and dermal exposures to consumers and bystanders under one COU: Consumer use – plastic and rubber products. The Agency is preliminarily determining that consumer exposures to 1,2-dichloroethane do not significantly contribute to unreasonable risk.

General Population Summary
EPA evaluated risk of injury to human health due to cancer and non-cancer effects from inhalation from ambient air exposure to fenceline communities. EPA did not identify unreasonable risk of injury to the general population based on either cancer or non-cancer risks from 1,2-dichloroethane from ambient air or other assessed routes of exposure (incidental dermal from swimming, drinking water exposure, fish ingestion, incidental oral ingestion from swimming, and soil ingestion).

Byproducts Summary
EPA evaluated the production of five byproducts (1,1-dichloroethane [CASRN 75-34-3], trichloroethylene [CASRN 79-01-6], perchloroethylene [CASRN 127-18-4], methylene chloride [CASRN 75-09-2], and carbon tetrachloride [CASRN 56-23-5]) produced during the manufacture of 1,2-dichloroethane as part of the Manufacturing – domestic manufacturing COU. The manufacture of 1,2-dichloroethane also produces 1,1,2-trichloroethane (CASRN 79-00-5) and *trans*-1,2-dichloroethylene (CASRN 156-60-5) as byproducts; however, these byproducts will be assessed in separate risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene, respectively. Based on the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l), the Agency has considered the risk (*i.e.*, human health and environmental risks related to exposures to byproducts) in this preliminary 1,2-dichloroethane unreasonable risk determination and concluded that, based on the reasonably available information, the risk identified in the draft byproducts assessment is not expected to change any of the conclusions of this preliminary risk determination (see Sections 6.1 and 6.2 below). More information is provided in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l).

6.1 Environment

Based on the environmental risk assessment, EPA is preliminarily determining that 1,2-dichloroethane presents unreasonable risk of injury to the environment due to chronic exposure for aquatic invertebrates associated with the Manufacturing – domestic manufacture and Disposal COUs. For environmental pathways that were quantitatively assessed, the Agency used a two-tiered approach with refinements. First, EPA compared the highest release estimates to environmental media for a given pathway with the hazard values for aquatic and terrestrial species. 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 species, it was determined that exposures due to releases from other COUs would not lead to environmental risk. Second, if the analysis indicated risk, then the next-highest releasing exposure scenario was evaluated until all COUs were characterized. This tiered approach was taken for the Manufacturing – domestic manufacture and Disposal COUs. Discussion of the two-tiered approach and the refinements made can be found in Section 4.3.

Calculated risk quotients (RQs) 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 exposures are the same as the concentration that causes effects. An RQ less than 1, when the exposure is less than the effect concentration, generally indicates that there is no risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance. An RQ exceeding 1, when the exposure is greater than the effect concentration, generally indicates that there is risk of injury to the environment that would support a determination of unreasonable risk for the chemical substance. Additionally, if an RQ is 1 or greater, EPA evaluates whether the RQ is 1 or greater for the days of exceedance before making a determination of unreasonable risk.

EPA evaluated aquatic RQs and days of exceedance across two days-of-release scenarios: (1) at a hazard based-release duration (21 consecutive days of release); and (2) at the total number of operating days assumed as the maximum release duration. The Agency did not have reasonably available information to support the hazard-based release scenario nor the assumption that annual loads are released in consecutive days. For the second days-of-release scenario, EPA used different durations based on the OES: 350 days for Manufacturing and Processing as a reactant OESs; 250 days for the Processing/incorporation into formulation, mixture, or reaction product and Waste handling, treatment, and disposal OESs; and 365 days for the Waste handling, treatment, and disposal (POTW) OES. The Agency is basing this preliminary risk determination on the operating days release scenario becausethe risk estimates are based on known or generic patterns of operation for each OES. EPA evaluated terrestrial RQs by modeling the highest predicted daily air deposition to soil and is preliminarily determining they do not contribute to unreasonable risk from 1,2-dichloroethane to the environment. EPA evaluated aquatic and terrestrial exposure via trophic transfer RQs using conservative assumptions for factors such as area use or absorption from diet and is preliminarily determining they do not contribute to unreasonable risk from 1,2-dichloroethane to the environment via trophic transfer. Additional details are available in Section 4.3.

Based on the first-tier assessment, EPA is preliminarily determining that four COUs had RQs below 1 and do not contribute to the unreasonable risk of 1,2-dichloroethane. Based on the second-tier assessment, seven COUs do not contribute to the unreasonable risk of 1,2-dichloroethane, but two COUs (Manufacturing – domestic manufacture and Disposal) significantly contribute to the unreasonable risk of 1,2-dichloroethane to the environment. EPA did not have enough data to calculate risk estimates for all COUs when existing data for the COU indicated only negligible environmental releases. EPA characterized the risk by integrating limited amounts of reasonably available information in a qualitative characterization (see Table 4-3). Based on that qualitative characterization in Sections 4.3.3 and 4.3.4, EPA expects that seven COUs have negligible environmental releases and therefore do not significantly contribute to the unreasonable risk of 1,2-dichloroethane. More information about how COUs were assessed for risk to the environment is available in Section 4.3 of this draft risk evaluation.

Byproducts

EPA also evaluated risk to the environment from byproducts produced during the manufacture of 1,2-dichloroethane and has preliminarily determined that these byproducts do not significantly contribute to unreasonable risk to the environment. RQs for aquatic species for each byproduct were all less than 1, and no risk was found for terrestrial species based on physical and chemical and fate properties of the byproducts. Uncertainties and confidence in the exposure and hazard assessment for the byproducts have been described in the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l). EPA has moderate confidence that the byproducts do not present risk to aquatic and terrestrial species from releases to air, water, and land. For more information, see Section 3 of the *Draft Byproducts Assessment for 1,2-Dichloroethane*.

6.1.1 Basis for Unreasonable Risk to the Environment

Based on the draft risk evaluation for 1,2-dichloroethane—including the populations and exposures assessed, the environmental effects, the derived risk estimates, and consideration of uncertainties—EPA has preliminarily determined two COUs, Manufacturing – domestic manufacture, and Disposal, significantly contribute to unreasonable risk of injury to the environment for 1,2-dichloroethane due to mortality, growth, reproduction, and development effects to aquatic invertebrates from chronic exposures, as described in Section 4.3.

EPA quantitatively evaluated surface water, sediment, air deposition to soil, as well as trophic transfer exposure pathways. The Agency qualitatively evaluated biosolids and landfills exposure pathways.

Consistent with the Agency's preliminary 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's overall environmental risk characterization confidence level is moderate to robust, as summarized in Section 4.3.5.

6.2 Human Health

Calculated risk estimates (margin of exposures [MOEs[15]] or cancer risk estimates[16]) can provide a risk profile of 1,2-dichloroethane 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 in consideration reasonably available information (*e.g.*, test order information, site visits). 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 such controls in place. In this draft risk evaluation, monitoring data submitted pursuant to a test order submission from the Vinyl Institute (Stantec ChemRisk, 2024) and information provided by stakeholders (EPA-HQ-OPPT-2018-0427-0065; EPA-HQ-OPPT-2018-0427-0067) allowed EPA to make a preliminary unreasonable risk determination taking into consideration information regarding workers wearing PPE. However, when the Agency compared calculated risk estimates with the relative risk reduction achieved by the reported PPE use in the test order, the Agency determined that the relevant COUs significantly contribute to the unreasonable risk of 1,2-dichloroethane—even after accounting for the reported PPE use. In addition, the risk estimates are based on workplace exposure scenarios, including monitoring data that reflect existing OSHA workplace requirements (*i.e.*, OSHA permissible exposure limits [PELs]) and industry or sector exposure controls.

An MOE that is less than the benchmark MOE is a starting point for informing a determination of unreasonable risk of injury to health, based on non-cancer effects. Similarly, a calculated cancer risk estimate that is greater than the cancer benchmark is a starting point for informing a determination of unreasonable risk of injury to health from cancer. Inhalation cancer risk estimates represent the incremental increase in probability of an individual in an exposed population developing cancer over a lifetime (excess lifetime cancer risk [ELCR]) following exposure to the chemical. Standard cancer benchmarks used by EPA and other regulatory agencies are an increased cancer risk ranging from 1 in 1,000,000 to 1 in 10,000 (*i.e.*, 1×10^{-6} to 1×10^{-4}), depending on the subpopulation(s) exposed and other considerations. In this draft assessment the Agency considers 1×10^{-4} as the appropriate benchmark for increased cancer risk for workers, including ONUs.

[15] 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 5.3.1 has additional information on the risk assessment approach for human health.
[16] Section 5.3.1 explains how cancer risk estimates are calculated.

It is important to emphasize that these calculated risk estimates alone are not "bright-line" indicators of unreasonable risk. In this preliminary risk determination, EPA considered risk-related factors beyond exceedance of benchmarks—including the Agency's confidence in the data, an evaluation of the strengths, limitations, uncertainties, and confidences associated with the information used to inform the risk estimate and risk characterization. Descriptions of risk estimates that are based on highly refined hazard and exposure information would be considered differently than risk estimates based on conservative assumptions on both hazard and exposure. The process of determining unreasonable risk is made on a case-by-case basis, given the inherently unique nature of chemical-specific risk evaluations. For this 1,2-dichloroethane draft risk evaluation, EPA accounted for the following PESS groups: workers, infants exposed to drinking water during formula bottle feeding, subsistence and Tribal fishers, men of reproductive age, individuals with preexisting conditions such as chronic kidney disease, people with the aldehyde dehydrogenase-2 polymorphism, lifestyle factors such as smoking cigarettes or secondhand smoke, and communities who live near facilities that emit 1,2-dichloroethane (see Section 5.3.2 and Table 5-20). Although there is likely to be variability in susceptibility across the human population, EPA did not identify specific human groups that are expected to be more susceptible to cancer or non-cancer effects following 1,2-dichloroethane exposure.

EPA has preliminarily determined that the unreasonable risk may be presented by 1,2-dichloroethane due to the following:

- Non-cancer olfactory effects in workers and ONUs from acute inhalation exposures;
- Non-cancer male reproductive effects in workers and ONUs from intermediate and chronic inhalation exposures;
- Non-cancer renal system effects in workers from dermal exposures; and
- Cancer risk (tumors) to workers from inhalation and dermal exposures, and to ONUs from inhalation exposures.

The acute and intermediate benchmark MOE for 1,2-dichloroethane is 30; the chronic benchmark MOE is 300. Derived from the total uncertainty factors (UFs), these benchmark MOEs are conservative given the reasonably available information as described in Section 5.2.2.

Byproducts

EPA also evaluated risk to human health from byproducts produced during the manufacture of 1,2-dichloroethane and has preliminarily determined that these byproducts significantly contribute to unreasonable risk to human health. Trichloroethylene was preliminarily determined to significantly contribute to unreasonable risk due to chronic, non-cancer inhalation risk for operators, laboratory technicians, and ONUs at high-end exposures as well as chronic non-cancer dermal risk for workers at high-end exposures. Carbon tetrachloride was preliminarily determined to significantly contribute to unreasonable risk due chronic, non-cancer risk and cancer risk for operators, maintenance technicians, and laboratory technicians, at both central tendency and high-end inhalation and dermal exposures, as well as for ONUs at high-end inhalation exposures. No risks were preliminarily identified for the other byproduct chemicals (see Table 6-3). As explained in Section 7 the *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l), EPA has moderate to robust confidence in the byproducts risk estimates for workers and ONUs. The Agency has robust confidence that the byproducts do not present risk to the general population from releases to air and water. For more information, see Section 7 of the *Draft Byproducts Assessment for 1,2-Dichloroethane*.

6.2.1 Basis for the Unreasonable Risk to Workers

Based on the occupational risk estimates and related risk factors, EPA has preliminarily determined that 15 COUs significantly contribute to the unreasonable risk to workers from 1,2-dichloroethane.

EPA analyzed dermal and inhalation exposure in the occupational scenarios using a time-weighted average (TWA) for a typical 8-hour shift (see Section 5.3) for male and female workers. Estimates of central tendency and high-end inhalation and dermal exposures were made for workers directly working with 1,2-dichloroethane as well as separate estimates for inhalation exposures for ONUs not directly handling 1,2-dichloroethane, as appropriate. Because 1,2-dichloroethane is primarily used at manufacturing and processing facilities, EPA does not expect workers at such facilities to be younger than 18 years old. Non-cancer risk estimates were calculated from acute, intermediate, and chronic exposures. For most OESs, acute refers to an exposure timeframe of one 8-hour workday, intermediate refers to an exposure timeframe of 22 workdays (8 hours per day), and chronic refers to an exposure timeframe of 250 days per year for 31 to 40 years (8 hours per day).

In this draft risk evaluation, EPA calculated risk estimates for both central tendency and high-end exposure levels for workers and ONUs. Risk estimates based on high-end exposure levels are generally intended to cover individuals exposed at sentinel exposure levels, whereas risk estimates at the central tendency exposure are intended to cover average or typical worker exposure. To determine whether a specific COU significantly contributes to the unreasonable risk, EPA may consider chemical-specific information and risk-related factors, including how the central tendency and high-end risk estimates best represent each COU (*e.g.*, where EPA may rely on central tendency exposures when the high-end risk estimates may not represent sentinel exposure levels accurately). Additionally, the Agency considers a threshold for determining unreasonable risk due to cancer effects based on risk estimates above a benchmark of 1×10^{-4} for workers. For all COUs with sufficient confidence to support a risk determination, based on the reasonably available information as well as the Agency's confidence and uncertainties described earlier in this draft risk evaluation, EPA is basing its preliminary unreasonable risk determination for workers and ONUs on the high-end for all inhalation exposures when robust personal breathing zone (PBZ) monitoring data are available. However, when robust PBZ monitoring data for workers and ONUs are not available, EPA is basing its preliminary unreasonable risk determination on the high-end for inhalation exposures for acute and intermediate exposures, and the central tendency for chronic exposures and cancer risks.

For all COUs for which the use is known to take place in closed systems (Manufacturing – domestic manufacture and Processing – as a reactant) and with sufficient confidence to support a risk determination, and based on the reasonably available information as well as the Agency's confidence and uncertainties described earlier in this risk evaluation, EPA is basing its unreasonable risk determination for workers for acute and intermediate dermal exposure on the high-end, and for chronic dermal exposures and dermal cancer risks on the central tendency. For all other COUs, the Agency is basing its unreasonable risk determination for workers for dermal exposure on the high-end for all exposures. The central tendency risk estimates were identified as more appropriate than the high-end for chronic dermal exposures and dermal cancer risks for uses known to take place in closed systems (Manufacturing – domestic manufacture and Processing – as a reactant), which was due to differences in the magnitude and frequency of expected workplace exposures. However, for all other COUs, the high-end dermal risk estimates were identified as more appropriate because of increased risks to workers due to not taking place in closed systems (see also Section 5.3.8.1). For COUs where the Agency was not able to estimate ONU inhalation exposure from monitoring data or models, the ONU exposure was assumed to be equivalent to the central tendency exposure for workers for the corresponding COU, as described in Section 5.1.1.1.2. Additional information on occupational risk estimates is provided in Section 5.3.3.

For five COUs, EPA characterized the risk by integrating limited amounts of reasonably available information in a qualitative characterization. Based on this qualitative characterization, the Agency does not expect the following four COUs to contribute to the unreasonable risk of 1,2-dichloroethane due to negligible human exposures: Distribution in commerce; Industrial use – fluids (closed systems) – heat transferring agent; Commercial use – plastic and rubber products; and Commercial use – fuels and fuel additives. For the fifth COU, EPA characterized risks to consumers using a screening level approach (see Section 5.3.5). Based on this screening approach, the Agency does not expect the Consumer use – plastic and rubber products COU to contribute to the unreasonable risk of 1,2-dichloroethane due to negligible human exposures.

EPA used test order data from two submissions, the Vinyl Institute and BASF (BASF, 2021) to estimate and assess occupational exposures for a total of nine COUs. EPA used test order data from the Vinyl Institute for the following four COUs: Manufacturing – domestic manufacturing; Processing as a reactant – intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing; Processing – recycling; and Industrial use – process regulator – *e.g.* catalyst moderator; oxidation inhibitor. EPA used test order data from BASF for the following four COUs: Processing incorporated into formulation, mixture, or reaction product – fuel and fuel additives and all other petroleum and coal products manufacturing; Processing incorporated into formulation, mixture, or reaction product – processing aids: specific to petroleum production; plastics material and resin manufacturing; Processing incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural manufacturing; and Industrial use – other use – process solvent. EPA used certain data points from both the Vinyl Institute and BASF test order data for the final COU, Commercial use – laboratory chemical. Based on the workplace exposure monitoring data, EPA has moderate to robust confidence that the inhalation risk estimates are sufficient for determining whether a COU significantly contributes to unreasonable risk. The Agency used the high-end exposure levels as the basis of the draft unreasonable risk determination for the inhalation exposure to 1,2-dichloroethane for the COUs evaluated with monitoring data and data from the test orders.

EPA used other workplace exposure monitoring data and/or modeling to estimate and assess occupational exposures for the following five COUs: Manufacturing – import; Processing – repackaging; Industrial use – adhesives and sealants; Industrial use – lubricants and greases – solid film lubricants and greases; and Disposal. For these COUs, EPA used high-end MOEs for acute and intermediate worker inhalation risks and central tendency MOEs for chronic non-cancer, cancer, and all ONU inhalation risks.

For the Manufacturing – domestic manufacture, and Processing – as a reactant COUs, the Agency considered known workplace controls. The Vinyl Institute test order submission characterized the facility control operations known and expected to be in place depending on the potential exposure during standard, task-specific, and emergency activities—including engineering controls, administrative controls, PPE (*e.g.,* respirators achieving a level of APF 10–1,000 and dermal protection), and chemical safety plans (Stantec ChemRisk, 2024). While descriptions of certain facility control operations were presented in that test order, EPA does not have confidence that these descriptions are representative of facility controls of all facilities manufacturing or processing 1,2-dichloroethane as a reactant. The Agency is seeking additional information on the use of exposure controls and PPE (see also Section 5.3.3.1).

The Processing – repackaging, Manufacturing – import, and Industrial use – lubricants and greases – solid film lubricants and greases COUs have MOEs below the benchmark at the central tendency and high-end for both non-cancer and cancer exposures. However, as discussed in Section 5.3.8.1, EPA has slight to moderate confidence in these MOEs for both the non-cancer and cancer exposures because of the uncertainties in the modeled exposure values. Both COUs were found to significantly contribute to unreasonable risk for 1,2-dichloroethane. Workplace controls, including the use of PPE, could be used to reduce exposure and risk to a level that would not be considered unreasonable.

Four COUs—Processing – incorporated into a formulation, mixture, or reaction product – fuels and fuel additives and all other petroleum and coal products manufacturing; Processing – incorporated into a formulation, mixture, or reaction product – processing aids: specific to petroleum production; plastics material and resin manufacturing; Processing – incorporated into a formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing; and Industrial use – other use – process solvent—have MOEs below the benchmark at the central tendency and high-end for both non-cancer and cancer exposures. As discussed in Section 5.3.8.1, EPA has high confidence in these MOEs for both the non-cancer and cancer inhalation exposures. Therefore, the Agency is preliminary determining that these COUs significantly contribute to the unreasonable risk for 1,2-dichloroethane. Workplace controls, including the use of PPE, could be used to reduce exposure and risk to a level that would not be considered unreasonable.

The risk estimates for the Disposal COU are below the benchmark at the central tendency and high-end for both non-cancer and cancer exposures. As discussed in Section 5.3.8.1, although EPA has slight confidence in the MOEs for the Waste handling, treatment, and disposal – landfill OES, the Agency has moderate confidence in the MOEs for the Waste handling, treatment, and disposal – WWT OES. (These are the two OESs for which EPA evaluated worker exposures for the disposal COU.) Thus, based on the moderate confidence in the Waste handling, treatment, and disposal – WWT OES, EPA is preliminarily determining that the Disposal COU significantly contributes to the unreasonable risk for 1,2-dichloroethane.

Dermal Considerations

EPA derived dermal risk estimates for both a deterministic and probabilistic calculation. The deterministic model used a single set of representative parameters but did not address variability in exposure duration and frequency. The probabilistic model did use the full distribution for most of the modeled parameters (except for fraction absorbed and event frequency). EPA used the probabilistic model as the basis for the unreasonable risk determination for 1,2-dichloroethane because the Agency had increased confidence in the probabilistic model, as further discussed in Section 5.1.1.1.2.

Based on the uncertainties described in Section 5.3.8.1 of this draft risk evaluation, EPA has moderate to robust confidence that the dermal risk estimates generated by the model are sufficient for determining whether a COU presents unreasonable risk. Generally, the EPA used the high-end exposure estimates for acute, intermediate, and chronic dermal risk determination. For the Manufacturing – domestic manufacture and Processing – as a reactant COUs, which the EPA understands take place within closed systems, the Agency used the central tendency exposure estimates for the chronic and cancer dermal risk determination and high-end exposure estimates for the acute and intermediate risk determinations.

6.2.2 Basis for Proposed No Unreasonable Risk to Consumers

EPA used peer-reviewed literature to gather data on consumer articles containing 1,2-dichloroethane. The Agency considered higher intensity consumer exposure scenarios where children are playing and mouthing ornaments and toys. These scenarios are meant to capture the higher exposures that are associated with and representative of children's higher oral and dermal exposures relative to body weight than to adults. EPA did not identify risks from any of the article exposure scenarios to children or adults.

Based on the consumer risk estimates and related risk factors, EPA has preliminarily determined that the consumer uses do not significantly contribute to the unreasonable risk of 1,2-dichloroethane. The Agency's overall confidence in the acute, intermediate, and chronic consumer inhalation, ingestion, and dermal exposure risk estimates ranges from moderate to robust. Additional information on the consumer analysis can be found in Sections 5.1.2 and 5.3.5 of this draft risk evaluation and Section 5 of the *Draft Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q).

6.2.3 Basis for Proposed No Unreasonable Risk to the General Population

Based on the draft risk estimates calculated using releases from manufacturing, processing, and commercial uses of 1,2-dichloroethane, as well as related risk factors, EPA is preliminarily determining that 1,2-dichloroethane, and the byproducts produced during the manufacture of 1,2-dichloroethane, do not present an unreasonable risk to the general population.

Ambient air was the primary pathway of concern for risk to the general population, including fenceline communities, from 1,2-dichloroethane. EPA did not identify unreasonable risk of injury to the general population based on either cancer or non-cancer risks from 1,2-dichloroethane from other assessed routes of exposure (incidental dermal from swimming, drinking water exposure, fish ingestion, incidental oral ingestion from swimming, and soil ingestion). Additionally, the non-cancer risk estimates for ambient air exposure for fenceline communities did not indicate risk. Cancer risk estimates for ambient air exposures indicated an increased cancer risk for eight COUs at or above 1 in 1,000,000 to 1 in 10,000 (*i.e.*, 1×10^{-6} to 1×10^{-4}). Considering all the relevant risk-related information and uncertainties, EPA is preliminarily determining that 1,2-dichloroethane exposures to the general population do not significantly contribute to unreasonable risk to the general population due to cancer risk from inhalation exposure under these COUs (the reasons are discussed below).

EPA used NEI and TRI data to assess ambient air inhalation risks to the general population. EPA used AERMOD to evaluate exposures and then HEM to characterize risk to populations living near releasing facilities (fenceline communities). Risk estimates based on AERMOD modeling were calculated for the 10th, 50th, and 95th percentile exposures for each facility at each modeled distance (*i.e.*, 100–1,000, 1,000, and 2,500 m) and utilized TRI-reported releases (2015–2020), NEI-reported releases (2014 and 2017), and EPA-estimated releases for generic facilities/sites. Unlike AERMOD, which does not consider whether populations may or may not be living near releasing facilities, HEM combines U.S. Census data with estimated ambient air concentrations to calculate maximum individual risks and the number of people within each census block with cancer risk above certain benchmarks. HEM was run using TRI data for either (1) releases reported for 2018, or (2) the highest release from 2015 to 2021 for facilities that did not report releases in 2018. The year 2018 was chosen as the primary year for HEM modeling because it had the highest overall releases from 2015 to 2021; therefore, the exposures calculated from HEM represent higher-end exposure scenarios for populations living withing 50,000 m of releasing facilities. These HEM results were calculated using the daily averages of hourly estimated concentrations averaged across 365 days that account for the conditions of that specific facility location, such as prevailing winds and local meteorology. Because stack information is not available in TRI, default release areas for fugitive emissions and default stack parameters for point sources were used in modeling of releases reported to TRI. A comparison of risks based on data submitted to TRI and NEI (the latter database includes stack information) shows good agreement between the results when using each database for input parameters.

For risk to the general population, EPA typically considers an increased cancer risk above 1 in 1,000,000 to 1 in 10,000 (*i.e.*, 1×10^{-6} to 1×10^{-4}). Again, these estimates are not treated as a "bright line" and other risk-based factors are considered (*e.g.*, confidence in the hazard and exposure characterization, duration, magnitude, uncertainty, and populations exposed) for the purpose of making an unreasonable risk determination. EPA's analytical framework under TSCA is similar to other EPA programs (*e.g.*, the Clean Air Act, Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]), which include consideration of other relevant risk-related information and uncertainties such as the overall incidence of cancer as well as the number of persons exposed within each individual lifetime risk range. As required by TSCA, EPA also considers PESS.

Based on EPA's analysis, there were seven COUs (*i.e.*, Manufacturing – domestic manufacture; Processing – incorporated into a formulation, mixture, or reaction product – fuel and fuel additives and all other petroleum and coal products manufacturing; Processing – incorporated into a formulation, mixture, or reaction product – processing aids: specific to petroleum production; plastics material and resin manufacturing; Processing – incorporated into a formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing; Processing – recycling; Industrial use – other use – process solvent; and Industrial use – process regulator – *e.g.*, catalyst moderator, oxidation inhibitor) where the facility releases resulted in increased maximum cancer risk estimates within or above this cancer range. The manufacturing COU was the only COU with risk estimates above the cancer range (*i.e.*, above 1×10^{-4}) associated with the modeled radial distance analyses from a single manufacturing facility. This facility is discussed below. The remaining seven COUs were associated with (1) individual maximum cancer risk estimates towards the lower-end of the range (*i.e.*, above 1×10^{-6} but below 1×10^{-5}); and (2) a lower number of people with elevated risk from 1,2-dichloroethane (an estimated total of 2,519 individuals were exposed at a cancer risk between 1×10^{-6} and 1×10^{-5}). This resulted in a maximum estimated 0.00034 excess cancer cases per year for the populations living within 50 km of all facilities associated with all seven of these COUs. This assumes that individuals are exposed 24 hours/day for a continuous lifetime exposure of 70 years.

Only one manufacturing facility (TRI ID 42029WSTLK2468I), with a total reported facility release ranging from 48,199 to 119,747 lb/year (based on TRI reporting from 2015–2020), resulted in risk estimates above the cancer range (*i.e.*, above 1×10^{-4}) and this highest release facility is the one presented in Table 5-30 and Table 5-31. EPA's analysis of the Manufacturing COU resulted in a range of cancer risk with the highest being 2.78×10^{-4} and based on both EPA's radial distance analysis associated with this one facility and the 95th percentile at the 100 to 1,000 m distance. However, the distance from this facility's modeled release location to the centroid of the closest census block is over the 100 to 1,000 m radial distance (*i.e.*, 1,015 m). Therefore, there is no predicted population exposed at a risk level of 2.78×10^{-4}. The estimates at the next closest radial distance (*i.e.*, 1,000 m) range from 1.70×10^{-5} to 4.45×10^{-5}. However, as previously stated, because these AERMOD radial distance estimates do not consider whether populations may or may not be living near releasing facilities, EPA uses the HEM analysis, which combines U.S. Census data with estimated ambient air concentrations to ensure its risk decisions are more accurately reflective of real exposures. Based on the HEM Census block analysis, this facility resulted in the 2.01×10^{-5} maximum individual cancer risk presented in Table 5-30 and a population of 95 people exposed to risk at greater than or equal to 1 in 100,000 based on all the Census blocks within 50 km of the facility. EPA's assessment of the general population aligns with tools and modeling approaches used under the Clean Air Act to assess residual risk. EPA considers the combination of the risk level and the potentially exposed population, which results in an estimated range of 0.00014 to 0.000014 excess cancer cases per year for the population (95 people) with an estimated cancer risk that exceeds 1×10^{-5} but is below the 1×10^{-4} in this preliminary determination. This estimate assumes that individuals are exposed 24 hours/day for a continuous lifetime exposure of 70 years. Taken together, due to these potential biases toward high exposures—combined with relatively low maximum cancer risks, low cancer incidence, and a small exposed population—EPA is preliminarily determining that the Manufacturing – domestic manufacture COU, along with the other seven previously mentioned COUs, do not significantly contribute to unreasonable risk of 1,2-dichloroethane.

Overall, EPA has robust confidence in risk estimates that were calculated using release data reported to both TRI and NEI and that the risks are representative of actual exposures to the general population living near releasing facilities and PESS. The robust confidence is based on high levels of confidence in underlying release information used to estimate exposures, the completeness of the datasets modeled, and the modeling methods used. Additionally, the use of HEM allowed for the characterization of populations living near facilities and provided strong evidence for distances that are most relevant for general population exposure. However, there are uncertainties and potential conservatisms considered in the risk characterization and in EPA's preliminary determination of no unreasonable risk to the general population. As noted above, the modeled scenario informing both the radial distance and HEM estimates is based on continuous inhalation (24 hours a day) of ambient air concentrations over a lifetime (*i.e.*, 70–78 years) using the inputs from the highest release year for the facility. There is uncertainty in the assumption of continuous 1,2-dichloroethane exposure from ambient air to an individual all day, year-round, for their entire lifetime. This uncertainty extends to whether people spend a lifetime living in proximity to the specific facilities where risks are highest and in EPA's assumption of indoor air concentrations being equal to the 1,2-dichloroethane ambient air concentrations from releasing facilities. Additional information on EPA's overall confidence and uncertainties for the general population risk assessment can be found in Section 5.3.8.2. The Agency is requesting comment on its approach for assessing ambient air exposure for the general population—specifically on (1) the calculation and interpretation of additional cancer cases, including risk to PESS; and (2) how EPA can better align with existing programs and regulatory structures that characterize and assess risk to ambient air. These comments will be used to inform EPA's final 1,2-dichloroethane risk evaluation.

6.3 Additional Information Regarding the Basis for the Risk Determination

Table 6-1, Table 6-2, and Table 6-3 summarize the basis for this preliminary unreasonable risk determination of injury to human health and the environment presented in this draft 1,2-dichloroethane risk evaluation. In the environmental risk table (Table 6-1), the bolded RQs indicate that the RQ is greater than 1. For human health risk (Table 6-2 and Table 6-3), the bolded numbers indicate that the non-cancer MOE is below the benchmark value or the cancer risk is above the benchmark and significantly contributes to the unreasonable risk. For example, if EPA is making the preliminary unreasonable risk determination using the central tendency rather than the high-end exposures for a given COU, only the central tendency risk estimates will be bolded. The APFs of the PPE in parentheses for workers represents the minimum necessary measures required, when other exposure controls (*e.g.*, engineering controls) are not in place, so that the risk is no longer unreasonable. PPE is not included where the exposed population would not be expected to wear PPE (*e.g.*, ONUs and general population.)

Not all COUs, exposure routes, populations, or receptors evaluated are included in these tables. For this preliminary unreasonable risk determination, EPA considered the effects of 1,2-dichloroethane to human health for workers, ONUs, and the general population, as well as effects of 1,2-dichloroethane to human health and the environment from the exposures associated with the TSCA COUs, risk estimates, and uncertainties in the analysis. See Sections 4.3 and 5.3 of this draft risk evaluation for a summary of risk estimates.

Table 6-1. Supporting Basis for the Preliminary Unreasonable Risk Determination for the Environment for 1,2-Dichloroethane

COU			Population/ Receptor	Compartment	Risk Quotient (RQ)		
Life Cycle Stage	Category	Subcategory			Acute	Chronic	Algal
Manufacturing	Domestic manufacturing	Domestic manufacturing	Aquatic	Surface water	0.28	**7.0**	0.27
				Benthic pore water	0.27	0.35	N/A
				Sediment	N/A	**3.1**	N/A
Processing	Processing as a reactant	Reactant/intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Aquatic	Surface water	3.2E−02	0.81	3.1E−02
				Benthic pore water	3.1E−02	4.0E−02	N/A
	Recycling	Recycling		Sediment	N/A	0.35	N/A
	Industrial use	Industrial use/process regulator/oxidation inhibitor in controlled oxidative chemical reactions					
Processing	Incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: all other petroleum and coal products manufacturing/processing aids: specific to petroleum production/adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Aquatic	Surface water	1.7E−03	4.3E−02	1.7E−03
				Benthic pore water	1.6E−03	2.1E−03	N/A
				Sediment	N/A	1.8E−02	N/A
Disposal	Disposal	Disposal (waste handling, treatment, and disposal [incinerator])	Aquatic	Surface water	0.40	**10**	0.38
				Benthic pore water	0.34	0.44	N/A
				Sediment	N/A	**3.9**	N/A
		Disposal (waste handling, treatment, and disposal [POTW])	Aquatic	Surface water	0.19	**4.8**	0.19
				Benthic pore water	0.19	0.25	N/A
				Sediment	N/A	**2.2**	N/A
N/A = not assessed							

Table 6-2. Supporting Basis for the Preliminary Unreasonable Risk Determination for Human Health for 1,2-Dichloroethane

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Manufacturing	Domestic manufacture	Domestic manufacture	Worker	Dermal	CT	491	306	**234**	**4.1E−04**
					HE	287	179	137	7.9E−04
			Worker – operator	Inhalation	CT	**7.4** (74 with APF 10)	**22** (217 with APF 10)	**23** (581 with APF 25)	**2.6E−03** (5.2E−05 with APF 50)
					HE	**0.49** (487 with APF 1,000)	**1.4** (35 with APF 25)	**1.5** (1,529 with APF 50)	**5.1E−02** (5.1E−05 with APF 1,000)
			Worker – logistics technician	Inhalation	CT	209	613	656	9.1E−05
					HE	**15** (148 with APF 10)	43	**47** (465 with APF 10)	**1.7E−03** (6.7E−05 with APF 25)
			Worker – maintenance technician	Inhalation	CT	73	213	**228** (2,278 with APF 10)	**2.6E−04** (2.6E−05 with APF 10)
					HE	**2.2** (56 with APF 25)	**6.5** (65 with APF 10)	**7.0** (349 with APF 50)	**1.1E−02** (1.1E−05 with APF 1,000)
			Worker – laboratory technician	Inhalation	CT	76	222	**237** (2,375 with APF 10)	**2.5E−04** (2.5E−05 with APF 10)
					HE	**2.7** (68 with APF 25)	**8.0** (80 with APF 10)	**8.6** (429 with APF 50)	**9.0E−03** (9.0E−06 with APF 1,000)
			ONU	Inhalation	CT	254	745	797	7.5E−05
					HE	**2.2**	**6.5**	**7.0**	**1.1E−02**
			1,2-Dichloroethane as a byproduct: worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	137	7.9E−04
			1,2-Dichloroethane as a byproduct: worker – operator	Inhalation	CT	48	141	**151** (1,508 with APF10)	**4.0E−04** (4.0E−05 with APF 10)
					HE	**13** (132 with APF 10)	39	**41** (413 with APF 10)	**1.9E−03** (7.5E−05 with APF 25)
			1,2-Dichloroethane as a byproduct: worker – logistics technician	Inhalation	CT	55	160	**172** (1,717 with APF 10)	**3.5E−04** (3.5E−05 with APF 10)
					HE	**2.1** (52 with APF 25)	**6.1** (61 with APF 10)	**6.6** (328 with APF 50)	**1.2E−02** (1.2E−05 with APF 1,000)
			1,2-Dichloroethane	Inhalation	CT	169	496	531	**1.1E−04** (1.1E−05 with APF 10)

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	Category	Subcategory				Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})
Manufacturing	Domestic manufacture	Domestic manufacture	as a byproduct: worker – maintenance technician		HE	**9.9** (99 with APF 10)	**29** (290 with APF 10)	**31** (310 with APF 10)	**2.5E−06** (1.0E−04 with APF 25)
			1,2-Dichloroethane as a byproduct: worker – laboratory technician	Inhalation	CT	137	401	429	**1.4E−04** (1.2E−05 with APF 10)
					HE	47	137	**147** (1,468 with APF 10)	**5.3E−04** (5.3E−05 with APF 10)
			1,2-dichloroethane as a byproduct: ONU	Inhalation	CT	726	2,127	2,278	2.6E−05
					HE	**22**	65	**70**	**1.1E−03**
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	6.66E04	N/A	2.86E03	5.2E−05
					HE	1.68E02	N/A	5.38E02	2.8E−04
Manufacturing	Import	Import	Worker	Dermal	CT	491	219	**255**	**3.7E−04**
					HE	287	128	**146**	**7.4 E−04**
			Worker	Inhalation	CT	**0.72** (36 with APF 50)	**2.1** (53 with APF 25)	**24** (590 with APF 25)	**2.5E−03** (5.1E−05 with APF 50)
					HE	**0.19** (194 with APF 1,000)	**0.57** (570 with APF 1,000)	1.3 (1,281 with APF 1,000)	6.0E−02 (6.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**0.72**	**2.1**	**24**	**2.5E−03**
					HE	0.72	2.1	4.8	1.6E−02
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	2.74E04	N/A	3.18E05	1.8E−07
					HE	1.54E03	N/A	6.32E04	1.5E−06

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Processing	Processing – as a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	137	7.9E−04
			Worker – operator	Inhalation	CT	2,736	8,018	8,585	7.8E−06
					HE	741	2,172	2,325	3.3E−05
			Worker – logistics technician	Inhalation	CT	**21** (209 with APF 10)	61	**66** (656 with APF 10)	**9.1E−04** (9.1E−05 with APF 10)
					HE	**1.5** (39 with APF 25)	**4.5** (45 with APF 10)	**4.9** (4,852 with APF 1,000)	**1.6E−02** (1.6E−05 with APF 1,000)
			Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	1.7E−06
					HE	1,694	4,964	5,314	1.5E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	3.7E−06
					HE	2,372	6,949	7,440	1.0E−05
			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	1.1E−06
					HE	1.4E04	4.0E04	4.3E04	1.8E−06
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	2.22E05	N/A	2.68E04	4.7E−07
					HE	78	N/A	4.64E03	2.4E−06
	Processing – incorporated into formulation, mixture, or reaction product	Fuels and fuel additives: All other petroleum and coal products manufacturing	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	**137**	**7.9E−04**
			Worker	Inhalation	CT	**19** (187 with APF 10)	55	**59** (587 with APF 10)	**1.0E−03** (4.1E−05 with APF 25)
					HE	**2.5** (62 with APF 25)	**7.2** (72 with APF 10)	7.8 (388 with APF 50)	1.0E−02 (1.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**19**	55	**59**	**1.0E−03**
					HE	15	45	49	1.6E−03
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	7.59E06	N/A	8.29E05	5.6E−06
					HE	3.50E04	N/A	9.74E04	3.2E−05
		Processing aids: specific to petroleum production	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	**137**	**7.9E−04**
			Worker	Inhalation	CT	**19** (187 with APF 10)	55	**59** (587 with APF 10)	**1.0E−03** (4.1E−05 with APF 25)

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	Category	Subcategory				Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})
Processing					HE	**2.5** (62 with APF 25)	**7.2** (72 with APF 10)	7.8 (388 with APF 50)	1.0E−02 (1.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**19**	55	**59**	**1.0E−03**
					HE	15	45	49	1.6E−03
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	7.59E06	N/A	8.29E05	5.6E−06
					HE	3.50E04	N/A	9.74E04	3.2E−05
	Processing – incorporated into formulation, mixture, or reaction product	Adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	**137**	**7.9E−04**
			Worker	Inhalation	CT	**19** (187 with APF 10)	55	**59** (587 with APF 10)	**1.0E−03** (4.1E−05 with APF 25)
					HE	**2.5** (62 with APF 25)	**7.2** (72 with APF 10)	7.8 (388 with APF 50)	1.0E−02 (1.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**19**	55	**59**	**1.0E−03**
					HE	15	45	49	1.6E−03
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	7.59E06	N/A	8.29E05	5.6E−06
					HE	3.50E04	N/A	9.74E04	3.2E−05
	Repackaging	Repackaging	Worker	Dermal	CT	491	219	**255**	**3.7E−04**
					HE	287	128	**146**	**7.4 E−04**
			Worker	Inhalation	CT	**0.72** (36 with APF 50)	**2.1** (53 with APF 25)	**24** (590 with APF 25)	**2.5E−03** (5.1E−05 with APF 50)
					HE	**0.19** (194 with APF 1,000)	**0.57** (570 with APF 1,000)	1.3 (1,281 with APF 1,000)	6.0E−02 (6.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**0.72**	**2.1**	**24**	**2.5E−03**
					HE	0.72	2.1	4.8	1.6E−02
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	2.74E04	N/A	3.18E05	1.8E−07
					HE	1.54E03	N/A	6.32E04	1.5E−06

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Processing	Recycling	Recycling	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	137	7.9E−04
			Worker – operator	Inhalation	CT	2,736	8,018	8,585	7.8E−06
					HE	741	2,172	2,325	3.3E−05
			Worker – logistics technician	Inhalation	CT	**21** (209 with APF 10)	61	**66** (656 with APF 10)	**9.1E−04** (9.1E−05 with APF 10)
					HE	**1.5** (39 with APF 25)	**4.5** (45 with APF 10)	**4.9** (4,852 with APF 1,000)	**1.6E−02** (1.6E−05 with APF 1,000)
			Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	1.7E−06
					HE	1,694	4,964	5,314	1.5E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	3.7E−06
					HE	2,372	6,949	7,440	1.0E−05
			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	1.1E−06
					HE	1.4E04	4.0E04	4.3E04	1.8E−06
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	2.22E05	N/A	2.68E04	4.7E−07
					HE	78	N/A	4.64E03	2.4E−06
Distribution in commerce	Distribution in commerce	Distribution in commerce	Qualitatively Assessed						
Industrial Use	Adhesives and sealants	Adhesives and sealants	Worker	Dermal	CT	535	238	359	**2.6E−04**
					HE	313	139	**182**	**5.8E−04**
			Worker	Inhalation	CT	**0.77** (39 with APF 50)	**2.3** (57 with APF 25)	**2.4** (2,426 with APF 1,000)	**2.5E−02** (2.5E−05 with APF 1,000)
					HE	**9.0E−02** (90 with APF 1,000)	**0.26** (264 with APF 1,000)	0.28 (2,825 with APF 10,000)	0.27 (2.7E−05 with APF 10,000)
			ONU	Inhalation	CT	**4.0**	**12**	**12**	**4.8E−03**
					HE	3.6	10	11	6.9E−03
			General population – 100–1,000 m distance (NEI)	Inhalation	CT	3.44E06	N/A	3.43E05	1.8E−11
					HE	1.79E04	N/A	6.12E04	1.3E−10
	Functional fluids (closed systems)	Heat transferring agent	Qualitatively Assessed						
			Worker	Dermal	CT	6.7E03	3.0E03	3.2E03	3.0E−05

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Industrial Use	Lubricants and greases	Solid film lubricants and greases			HE	3.5E03	1.6E03	1.7E03	6.3E−05
			Worker	Inhalation	CT	**1.0** (51 with APF 50)	**3.0** (30 with APF 10)	**3.2** (3,222 with APF 1000)	**1.9E−02** (1.9 E−05 with APF 1,000)
					HE	**0.40** (397 with APF 1,000)	**1.2** (58 with APF 50)	1.2 (1,245 with APF 1,000)	6.2E−02 (6.2E−05 with APF 1,000)
			ONU	Inhalation	CT	**1.5**	**4.5**	**4.8**	**1.2E−02**
					HE	0.48	1.4	1.5	5.1E−02
			General population – 100–1,000 m distance (NEI)	Inhalation	CT	7.65E10	N/A	8.13E09	1.3E−07
					HE	4.05E08	N/A	1.12E09	7.4E−07
	Other use	Process solvent	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	**137**	**7.9E−04**
			Worker	Inhalation	CT	**19** (187 with APF 10)	55	**59** (587 with APF 10)	**1.0E−03** (4.1E−05 with APF 25)
					HE	**2.5** (62 with APF 25)	**7.2** (72 with APF 10)	7.8 (388 with APF 50)	1.0E−02 (1.0E−05 with APF 1,000)
			ONU	Inhalation	CT	**19**	55	**59**	**1.0E−03**
					HE	15	45	49	1.6E−03
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	7.59E06	N/A	8.29E05	5.6E−06
					HE	3.50E04	N/A	9.74E04	3.2E−05
	Process regulator	*e.g.* Catalyst moderator, Oxidation inhibitor	Worker	Dermal	CT	491	219	**234**	**4.1E−04**
					HE	287	128	137	7.9E−04
			Worker – operator	Inhalation	CT	2,736	8,018	8,585	7.8E−06
					HE	741	2,172	2,325	3.3E−05
			Worker – logistics technician	Inhalation	CT	**21** (209 with APF 10)	61	**66** (656 with APF 10)	**9.1E−04** (9.1E−05 with APF 10)
					HE	**1.5** (39 with APF 25)	**4.5** (45 with APF 10)	**4.9** (4,852 with APF 1,000)	**1.6E−02** (1.6E−05 with APF 1,000)
			Worker – maintenance technician	Inhalation	CT	1.1E04	3.3E04	3.5E04	1.7E−06
					HE	1,694	4,964	5,314	1.5E−05
			Worker – laboratory technician	Inhalation	CT	5,156	1.5E04	1.6E04	3.7E−06
					HE	2,372	6,949	7,440	1.0E−05

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Industrial Use			ONU	Inhalation	CT	1.7E04	5.0E04	5.3E04	1.1E−06
					HE	1.4E04	4.0E04	4.3E04	1.8E−06
			General oopulation – 100–1,000 m distance (TRI)	Inhalation	CT	2.22E05	N/A	2.68E04	4.7E−07
					HE	7.84	N/A	4.64E03	2.4E−06
	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-aerosol – worker	Dermal	CT	494	220	**235**	**4.0E−04**
					HE	289	129	**138**	**7.9E−04**
			Non-aerosol – Worker	Inhalation	CT	**0.26** (258 with APF 1,000)	**0.76** (38 with APF 50)	**0.81** (809 with APF 1,000)	**7.4E−02** (7.4E−05 with APF 1,000)
					HE	**4.6E−02** (46 with APF 1,000)	**0.13** (134 with APF 1,000)	0.14 (1,434 with APF 10,000)	0.54 (5.4E−05 with APF 10,000)
			Non-aerosol – ONU	Inhalation	CT	**3.2**	**9.5**	**10**	**5.9E−03**
					HE	0.39	1.1	1.2	6.3E−02
			Aerosol – worker	Dermal	CT	*	*	*	*
					HE	*	*	*	*
			Aerosol – worker	Inhalation	CT	*	*	*	*
					HE	*	*	*	*
			Aerosol – ONU	Inhalation	CT	*	*	*	*
					HE	*	*	*	*
			General population – 100–1,000 m distance (TRI)	Inhalation	CT	3.57E08	N/A	2.29E07	6.52E−09
					HE	1.42E06	N/A	5.64E06	2.65E−08
Commercial Use	Plastic and rubber products	Plastic and rubber products	Qualitatively Assessed						
	Fuels and related products	Fuels and related products	Qualitatively Assessed						
	Other uses	Laboratory chemical	Worker	Dermal	CT	724	452	526	**4.0E−04**
					HE	356	222	**254**	**9.3E−04**
			Worker	Inhalation	CT	76	222	**237** (2,375 with APF 10)	**2.5E−04** (2.5E−05 with APF 10)
					HE	**2.7** (68 with APF 25)	**8.0** (80 with APF 10)	**8.6** (429 with APF 50)	**9.0E−03** (9.0E−06 with APF 1,000)

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	**Category**	**Subcategory**				**Acute Non-Cancer (Benchmark MOE = 30)**	**Intermediate Non-Cancer (Benchmark MOE = 30)**	**Chronic Non-Cancer (Benchmark MOE = 300)**	**Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})**
Commercial Use			ONU	Inhalation	CT	76	222	**237**	**2.5E−04**
					HE	76	222	237	3.3E−04
			General population – 100–1,000 m distance (NEI)	Inhalation	CT	4.20E06	N/A	9.88E05	1.5E−07
					HE	5.44E04	N/A	1.95E05	7.7E−07
Consumer Use	Plastic and rubber products	Plastic and rubber products	Qualitatively Assessed						
Disposal	Disposal	Waste handling, treatment, and disposal	Worker (wastewater treatment)	Dermal	CT	1,022	455	487	**1.9E−04**
					HE	397	177	**189**	**5.5E−04**
			Worker (wastewater treatment)	Inhalation	CT	40	118	**126** (1,260 with APF 10)	**4.8E−04** (4.8E−05 with APF 10)
					HE	**15** (151 with APF 10)	44	47 (473 with APF 10)	1.6E−03 (6.6E−05 with APF 25)
			ONU (Wastewater Treatment)	Inhalation	CT	40	118	**126**	**6.1E−04**
					HE	40	118	126	4.8E−04
			General population – 100–1,000 m distance (NEI) (wastewater treatment)	Inhalation	CT	N/A	N/A	4.64E06	3.2E−08
					HE	2.43E05	N/A	8.16E05	1.8E−07
			Worker (landfill)	Dermal	CT	*	*	*	*
					HE	*	*	*	*
			Worker (landfill)	Inhalation	CT	*	*	*	*
					HE	*	*	*	*
			ONU (landfill)	Inhalation	CT	*	*	*	*
					HE	*	*	*	*
				Inhalation	CT	1.60E07	N/A	8.06E05	6.48E−08

COU			Population	Exp. Route	Exp. Level	Human Health Effects (with APF to Address Risk)			
Life Cycle Stage	Category	Subcategory				Acute Non-Cancer (Benchmark MOE = 30)	Intermediate Non-Cancer (Benchmark MOE = 30)	Chronic Non-Cancer (Benchmark MOE = 300)	Lifetime Cancer (Benchmark for Workers = 10^{-4}; for General Population Ranges from 10^{-6} to 10^{-4})
Disposal	Disposal	Waste handling, treatment, and disposal	General population – 100–1,000 m distance (NEI) (landfill)		HE	1.35E05	N/A	1.49E05	3.75E−07
			General population – 100–1,000m distance (TRI) (incinerator)	Inhalation	CT	1.78E07	N/A	6.52E05	2.3E−07
					HE	3.32E04	N/A	1.18E05	1.3E−06
			General population – 100–1,000m distance (NEI) (remediation)	Inhalation	CT	2.03E06	N/A	3.85E05	3.88E−07
					HE	2.63E04	N/A	1.56E05	9.59E−07

CT = central tendency; HE = high-end; MOE = margin of exposure; N/A = not assessed
* = no risk determination because of slight confidence in MOEs
Note: APF indicates PPE required to address risk (*i.e.*, bring MOE above benchmark for non-cancer and below benchmark for lifetime cancer).

Table 6-3. Supporting Basis for the Preliminary Unreasonable Risk Determination for Human Health from the Light- and Heavy-End Streams of Byproducts for 1,2-Dichloroethane

COU	Byproduct	Population	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk)			
					Acute Non-Cancer	Intermediate Non-Cancer	Chronic Non-Cancer	Lifetime Cancer
Domestic manufacture (of 1,2-dichloroethane)	1,1-Dichloroethane	*Benchmarks*			*30*	*30*	*300*	*1.0E−04*
		Worker	Dermal	Central tendency	1,362	1,052	1,126	N/A
				High-end	787	351	NE	NE
		Worker – operator	Inhalation	Central tendency	2,279	2.8E04	7,214	8.3E−06
				High-end	394	4,895	1,248	6.2E−05
		Worker – maintenance technician	Inhalation	Central tendency	1.5E04	1.9E05	4.9E04	1.2E−06
				High-end	1,316	1.6E04	4,164	1.9E−05
		Worker – logistics technician	Inhalation	Central tendency	5.3E04	6.6E05	1.7E05	3.6E−07
				High-end	2,220	2.8E04	7,026	1.1E−05
		Worker – laboratory technician	Inhalation	Central tendency	2.2E04	2.8E05	7.0E04	8.5E−07
				High-end	4,523	1.3E04	3,407	2.3E−05
		ONU	Inhalation	Central tendency	5.1E04	6.4E05	1.6E05	3.7E−07
				High-end	778	9,658	2,462	3.1E−05
	Trichloroethylene (TCE)	*Benchmarks*			*10*	*N/A*	*30*	*1E−04*
		Worker	Dermal	Central tendency	1,117	N/A	61	1.4E−05
				High-end	432	N/A	NE	NE
		Worker – operator	Inhalation	Central tendency	733	N/A	36	3.9E−06
				High-end	171	N/A	**8.5** (85 with APF 10)	2.1E−05
		Worker – maintenance technician	Inhalation	Central tendency	2,740	N/A	136	1.0E−06
				High-end	614	N/A	31	6.0E−06
		Worker – logistics technician	Inhalation	Central tendency	2.4E04	N/A	1,179	1.2E−07
				High-end	5,662	N/A	281	6.5E−07
		Worker – laboratory technician	Inhalation	Central tendency	2,658	N/A	132	1.1E−06
				High-end	593	N/A	**29** (295 with APF 10)	6.2E−06
		ONU	Inhalation	Central tendency	3,983	N/A	2,423	7.1E−08
				High-end	877	N/A	**21**	4.2E−06
	Perchloroethylene (PCE)	*Benchmarks*			*10*	*N/A*	*10*	*1E−04*
		Worker	Dermal	Central tendency	157	N/A	676	7.3E−06
				High-end	52	N/A	NE	NE
		Worker	Inhalation	Central tendency	2,620	N/A	2.4E04	3.6E−07
				High-end	172	N/A	1,576	7.0E−06
		ONU	Inhalation	Central tendency	9.0E04	N/A	8.2E05	1.0E−08
				High-end	786	N/A	7,190	1.5E−06

COU	Byproduct	Population	Exposure Route	Exposure Level	Human Health Effects (with APF to Address Risk)			
					Acute Non-Cancer	Intermediate Non-Cancer	Chronic Non-Cancer	Lifetime Cancer
Domestic manufacture (of 1,2-dichloroethane)	Methylene chloride	*Benchmarks*			*30*	*N/A*	*10*	*1E−04*
		Worker	Dermal	Central tendency	4.3E04	N/A	5,854	6.5E−09
				High-end	1.4E04	N/A	NE	NE
		Worker	Inhalation	Central tendency	9,514	N/A	1,373	2.9E−08
				High-end	626	N/A	90	5.7E−07
		ONU	Inhalation	Central tendency	3.3E05	N/A	4.7E04	8.4E−10
				High-end	2,854	N/A	412	1.2E−07
	Carbon Tetrachloride (CTC)	*Dermal Benchmarks*			*30*	*N/A*	*30*	*1.0E−04*
		Worker	Dermal	Central tendency	243	N/A	34	**1.0E−03**
				High-end	85	N/A	NE	NE
		Inhalation Benchmarks			*10*	*N/A*	*30*	*1.0E−04*
		Worker – operator	Inhalation	Central tendency	165	N/A	**15** (147 with APF 10)	**2.3E−03** (9.3E−05 with APF 25)
				High-end	38	N/A	**3.4** (34 with APF 10)	**1.3E−02** (1.3E−05 with APF 1,000)
		Worker – maintenance technician	Inhalation	Central tendency	613	N/A	55	**6.2E−04** (6.2E−05 with APF 10)
				High-end	136	N/A	**12** (117 with APF 10)	**3.6E−03** (7.2E−05 with APF 50)
		Worker – logistics technician	Inhalation	Central tendency	5,333	N/A	476	7.2E−05
				High-end	1,255	N/A	112	**3.9E−04** (3.9E−05 with APF 10)
		Worker – laboratory technician	Inhalation	Central tendency	601	N/A	54	**6.4E−04** (6.4E−05 with APF 10)
				High-end	131	N/A	**12** (117 with APF 10)	**3.8E−03** (7.5E−05 with APF 50)
		ONU	Inhalation	Central tendency	892	N/A	80	**4.3E−04**
				High-end	195	N/A	**17**	**2.5E−03**

N/A = not assessed; NE = Not Estimated: EPA believes the central tendency from the closed system monitoring data is a more representative and appropriate exposure estimate for a frequent, repeated dermal exposure (*i.e.*, chronic, cancer) for risk determination.

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APPENDICES

Appendix A KEY ABBREVIATIONS AND ACRONYMS

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
ACGIH	American Conference of Governmental Industrial Hygienists
AD	Acute dose
ADD	Chronic average daily dose
AERMOD	American Meteorological Society (AMS)/EPA Regulatory Model
AF	Adjustment factor
AMTIC	Ambient Monitoring Technology Information Center
APDR	Acute potential dose rate
APF	Assigned protection factor
ARD	Acute retained dose
BAF	Bioaccumulation factor
BCF	Bioconcentration factor
BLS	Bureau of Labor Service (U.S.)
BMC	Benchmark concentration
BMCL	Lower confidence limit of the BMC
BMD	Benchmark dose
BMDL	Lower confidence limit of the BMD
BMR	Benchmark response
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential business information
CDR	Chemical Data Reporting
ChV	Chronic value
COC	Concentration of concern
COU	Condition of use
CRD	Chronic retained dose
CSF	Cancer slope factor
DMR	Discharge Monitoring Report
DOT	Department of Transportation (U.S.)
ECEL	Existing chemical exposure limit
ECHA	European Chemicals Agency
ELCR	Excess lifetime cancer risk
EPA	Environmental Protection Agency (U.S.)
ESD	Emission scenario document
GC/MS	Gas chromatography with mass spectroscopy
GS	Generic scenario
HCx	Hazardous concentration for x percent of species
HEC	Human equivalent concentration
HED	Human equivalent dose
HEM	Human Exposure Model
HERO	Health and Environmental Research Online (Database)
HLC	Henry’s Law constant
IADD	Intermediate average daily dose
IIOAC	Integrated Indoor-Outdoor Air Calculator (Model)
IRD	Intermediate retained dose

IRIS	Integrated Risk Information System (EPA)
IUR	Inhalation unit risk
KOC	Organic carbon: water partition coefficient
KOW	Octanol: water partition coefficient
LADC	Lifetime average daily concentration
LADD	Lifetime average daily dose
LCD	Life cycle diagram
LCRD	Lifetime chronic retained dose
LCx	Lethal concentration at which x percent of test organisms die
LOAEL	Lowest-observed-adverse-effect level
LOD	Limit of detection
LOEC	Lowest-observed-effect concentration
LOQ	Limit of quantification
MCL	Maximum contaminant limit
MOE	Margin of exposure
NAICS	North American Industry Classification System
ND	Non-detect
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHDPlus	National Hydrography Dataset Plus
NIOSH	National Institute for Occupational Safety and Health
NOAEL	No-observed-adverse-effect level
NOEC	No-observed-effect-concentration
NPDES	National Pollutant Discharge Elimination System
NPDWR	National Primary Drinking Water Regulation
NRC	National Response Center
NTP	National Toxicology Program
OCSPP	Office of Chemical Safety and Pollution Prevention (U.S.)
OECD	Organisation for Economic Co-operation and Development
OEHHA	Office of Environmental Health Hazard Assessment (California)
OEL	Occupational exposure limit
OES	Occupational exposure scenario
OEV	Occupational exposure value
ONU	Occupational non-user
OPPT	Office of Pollution Prevention and Toxics (U.S.)
OSHA	Occupational Safety and Health Administration
PBZ	Personal breathing zone
pOEL	Provisional occupational exposure limit
PEL	Permissible exposure limit
PESS	Potentially exposed or susceptible subpopulations
PF	Protection factor
POD	Point of departure
POTW	Publicly owned treatment works
PSC	Point Source Calculator
RCRA	Resource Conservation and Recovery Act
RQ	Risk quotient
SACC	Science Advisory Committee on Chemicals
SDS	Safety data sheet
SDWA	Safe Drinking Water Act

SEG	Similar exposure group
SIC	Standard Industrial Classification
SpERC	Specific Environmental Release Categories
SSD	Species sensitivity distribution
STEL	Short-term exposure limit
TLV	Threshold Limit Value
TRI	Toxics Release Inventory
TRV	Toxicity reference value
TSCA	Toxic Substances Control Act
TSD	Technical support document
TWA	Time-weighted average
VOC	Volatile organic compound
VVWM	Variable Volume Water Model
WHO	World Health Organization
WQP	Water Quality Portal
WWT	Wastewater treatment
UF	Uncertainty factor
U.S.	United States

Appendix B REGULATORY AND ASSESSMENT HISTORY

B.1 Federal Laws and Regulations

Table_Apx B-1. Federal Laws and Regulations for 1,2-Dichloroethane

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
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.	1,2-dichloroethane is one of the 20 chemicals EPA designated as a High-Priority Substance for risk evaluation under TSCA (84 FR 71924, Dec. 30, 2019). Designation of 1,2-dichloroethane as a high-priority substance constitutes the initiation of the risk evaluation on the chemical.
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.	1,2-dichloroethane manufacturing (including importing), processing and use information is reported under the CDR rule (85 FR 20122, April 2, 2020).
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.	1,2-dichloroethane 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.	Seventeen health and safety studies were received for 1,2-dichloroethane (2021–2022) (U.S. EPA, 2019a). (Accessed October 21, 2024).
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.	Nine risk reports were received for 1,2-dichloroethane (years when the submissions were received: 1990–2022) (U.S. EPA, ChemView. Accessed October 18, 2024).
TSCA – section 4	Provides EPA with authority to issue rules and orders requiring manufacturers (including importers) and processors to test chemical substances and mixtures.	Six chemical data submissions from test rules and enforceable consent agreements were received for 1,2-dichloroethane: one acute inhalation toxicity study (2006), four studies on metabolism and pharmacokinetics (2005, 2006, 2009, 2010) and one study on neurological toxicity (2006) (U.S.

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
		EPA, ChemView. Accessed October 18, 2024).
Emergency Planning and Community Right-to-Know Act (EPCRA) – section 313	Requires annual reporting from facilities in specific industry sectors that employ 10 or more full-time equivalent employees and that manufacture, process or otherwise use a TRI-listed chemical in quantities above threshold levels. A facility that meets reporting requirements must submit a reporting form for each chemical for which it triggered reporting, providing data across a variety of categories, including activities and uses of the chemical, releases and other waste management (*e.g.*, quantities recycled, treated, combusted) and pollution prevention activities (under section 6607 of the Pollution Prevention Act). These data include on- and off-site data as well as multimedia data (*i.e.*, air, land, and water).	1,2-dichloroethane is a listed substance subject to reporting requirements under 40 CFR 372.65 effective as of January 1, 1987.
CAA – section 111(b)	Requires EPA to establish new source performance standards (NSPS) for any category of new or modified stationary sources that EPA determines causes, or contributes significantly to, air pollution, which may reasonably be anticipated to endanger public health or welfare. The standards are based on the degree of emission limitation achievable through the application of the best system of emission reduction (BSER) which (taking into account the cost of achieving reductions and environmental impacts and energy requirements) EPA determines has been adequately demonstrated.	1,2-dichloroethane is subject to the NSPS for equipment leaks of volatile organic compounds (VOCs) in the synthetic organic chemicals manufacturing industry for which construction, reconstruction or modification began after January 5, 1981 (40 CFR part 60, Subparts VV, NNN, and RRR).
CAA – section 112(b)	Contains the original list of 189 HAPs. Under 112(c) of the CAA, EPA must identify and list source categories that emit HAP and then set emission standards for those listed source categories under CAA section 112(d). CAA section 112(b)(3)(A) specifies that any person may petition the Administrator to modify the list of HAP by adding or deleting a substance. Since 1990, EPA has removed 2 pollutants from the original list leaving 187 at present.	1,2-dichloroethane is listed as a HAP (42 U.S.C Section 7412).
CAA – section 112(d)	Directs EPA to establish, by rule, NESHAPs for each category or subcategory of listed major sources and area sources of HAP (listed pursuant to section 112(c)). The standards must require the maximum degree of emission reduction that EPA determines is achievable by each particular source category. This is	EPA has established NESHAPs for a number of source categories that emit 1,2-dichloroethane to air.

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	generally referred to as maximum achievable control technology (MACT).	
CAA – sections 112(d) and 112(f)	Risk and technology review (RTR) of section 112(d) national emission standards for hazardous air pollutants (NESHAP). Section 112(f)(2) requires EPA to conduct risk assessments for each source category subject to section 112(d) NESHAP that require maximum achievable control technology (MACT), and to determine if additional standards are needed to reduce remaining risks. Section 112(d)(6) requires EPA to review and revise the emission standards, as necessary, taking into account developments in practices, processes, and control technologies.	EPA has promulgated a number of RTR NESHAP (accessed November 12, 2025) and will do so, as required, for the remaining source categories with NESHAP.
CAA – section 112(k)	From the HAPs that EPA is required to control, EPA identified 30 that as a result of emissions from area sources pose the greatest potential health threat in urban areas. These HAPs are referred to as the 30 urban air toxics.	1,2-dichloroethane is listed as one of the 30 Urban Air Toxics.
Clean Water Act (CWA) – section 304(a)(1)	Requires EPA to develop and publish ambient water quality criteria (AWQC) reflecting the latest scientific knowledge on the effects on human health that may be expected from the presence of pollutants in any body of water.	In 2015, EPA published updated AWQC for 1,2-dichloroethane, including a recommendation of 9.9 (μg/L) for "Human Health for the consumption of Water + Organism" and 650 (μg/L) for "Human Health for the consumption of Organism Only" for states and authorized tribes to consider when adopting criteria into their water quality standards (80 FR 36986, June 29, 2015).
Clean Water Act (CWA) – sections 301, 304, 306, 307 and 402	Clean Water Act Section 307(a) establishes a list of toxic pollutants or combination of pollutants under the CWA. The statute specifies a list of families of toxic pollutants also listed at 40 CFR 401.15. The list of "priority pollutants" lists the individual chemical names within the toxic pollutants and is found in 40 CFR part 423 Appendix A. These are pollutants (along with non-conventional pollutants) for which best available technology effluent limitations must be established on either a national basis through rules (CWA Sections 301(b), 304(b), 307(b), 306) or on a case-by-case best professional judgement basis in National Pollutant Discharge Elimination System (NPDES) permits, see CWA Section	1,2-dichloroethane is designated as a toxic pollutant under Section 307(a)(1) of the CWA and as a priority pollutant under section 423 of the CWA and as such is subject to effluent limitations and any associated monitoring requirements of NPDES permits (40 CFR 401.15; 40 CFR part 423 Appendix A). Under CWA Section 304, 1,2-dichloroethane is included in the list of total toxic organics (TTO) (40 CFR 413.02(i)).

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
	402(a)(1)(B). EPA identifies the best available technology that is economically achievable (BAT) for that industry after considering statutorily prescribed factors and sets regulatory requirements based on the performance of that technology.	
Clean Water Act (CWA) – section 311(b) (2)(A) and 501(a) of the Federal Water Pollution Control Act.	Requires EPA to develop, promulgate, and revise as may be appropriate, regulations designating as hazardous substances, other than oil, which, when discharged present an imminent and substantial danger to the public health or welfare, including, but not limited to, fish, shellfish, wildlife, shorelines, and beaches.	1,2-dichloroethane is a designated hazardous substance in accordance with Section 311(b) (2)(A) of the Federal Water Pollution Control Act (40 FR 116.4, March 13, 1978).
Safe Drinking Water Act (SDWA) – Section 1412	Requires EPA to publish a non-enforceable maximum contaminant level goal (MCLG) for a contaminant for which EPA makes the determination that the contaminant: 1. may have an adverse effect on the health of persons; 2. is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and 3. in the sole judgement of the Administrator, regulation of the contaminant presents a meaningful opportunity for health risk reductions for persons served by public water systems. When EPA publishes an MCLG, EPA must also promulgate a National Primary Drinking Water Regulation (NPDWR) which includes either an enforceable maximum contaminant level (MCL), or a required treatment technique. Public water systems are required to comply with NPDWRs.	1,2-dichloroethane is subject to NPDWR under the SDWA with a MCLG of zero and an enforceable MCL of 0.005 mg/L (Section 1412).
Resource Conservation and Recovery Act (RCRA) – Section 3001	Directs EPA to develop and promulgate criteria for identifying the characteristics of hazardous waste, and for listing hazardous waste, taking into account toxicity, persistence, and degradability in nature, potential for accumulation in tissue and other related factors such as flammability, corrosiveness, and other hazardous characteristics.	1,2-dichloroethane is included on the list of hazardous wastes pursuant to RCRA 3001. RCRA Hazardous Waste Code: D028 (40 CFR 261.24); U077 (40 CFR 261.33); F024, F025 (40 CFR 261.31); K018, K019, K020, K029, K030 K096 (40 CFR 261.32).
Comprehensive Environmental Response, Compensation and Liability Act	Authorizes EPA to promulgate regulations designating as hazardous substances those substances which, when released into the environment, may present substantial danger to the public health or welfare or the environment. EPA must also promulgate	1,2-dichloroethane is a hazardous substance under CERCLA. Releases of 1,2-Dichloroethane in excess of 100 pounds must be reported (40 CFR 302.4).

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
(CERCLA) – Sections 102(a) and 103	regulations establishing the quantity of any hazardous substance the release of which must be reported under section 103. Section 103 requires persons in charge of vessels or facilities to report to the National Response Center if they have knowledge of a release of a hazardous substance above the reportable quantity threshold.	
Superfund Amendments and Reauthorization Act (SARA)	Requires the Agency to revise the hazardous ranking system and update the National Priorities List of hazardous waste sites, increases state and citizen involvement in the superfund program and provides new enforcement authorities and settlement tools.	1,2-dichloroethane is listed on SARA, an amendment to CERCLA and the CERCLA Priority List of Hazardous Substances. This list includes substances most commonly found at facilities on the CERCLA National Priorities List (NPL) that have been deemed to pose the greatest threat to public health.
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.	The FDA regulates 1,2-dichloroethane in bottled water. The maximum permissible level of 1,2-dichloroethane in bottled water is 0.005 mg/L (21 CFR 165.110). 1,2-Dichloroethane can be used as a solvent for the extraction of certain color additives in 21 CFR part 73 and used in the production of certain direct and indirect food additives as described in 21 CFR parts 172, 173, 175, 176, and 177.
Occupational Safety and Health Act (OSHA)	Requires employers to provide their workers with a place of employment free from recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress or unsanitary conditions (29 U.S.C section 651 et seq.). Under the Act, OSHA can issue occupational safety and health standards including such provisions as PEL, exposure monitoring, engineering and administrative control measures, and respiratory protection.	In 1979, OSHA issued occupational safety and health standards for 1,2-dichloroethane that included a PEL of 50 ppm TWA, exposure monitoring, control measures and respiratory protection (29 CFR 1910.1000).

Statutes/Regulations	Description of Authority/Regulation	Description of Regulation
Hazardous Materials Transportation Act (HMTA)	Section 5103 of the Act directs the Secretary of Transportation to: • Designate material (including an explosive, radioactive material, infectious substance, flammable or combustible liquid, solid or gas, toxic, oxidizing or corrosive material, and compressed gas) as hazardous when the Secretary determines that transporting the material in commerce may pose an unreasonable risk to health and safety or property. • Issue regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.	The Department of Transportation (DOT) has designated 1,2-dichloroethane as a hazardous material, and there are special requirements for marking, labeling and transporting it (U.S. DOT 49 CFR 172.101)

B.2 State Laws and Regulations

Table_Apx B-2. State Laws and Regulations for 1,2-Dichloroethane

State Actions	Description of Action[a]	
State Air Regulations	Allowable Ambient Levels: New Hampshire (Env-A 1400: Regulated Toxic Air Pollutants). Rhode Island (Air Pollution Regulation No. 22).	
State Drinking Water Standards and Guidelines	Arizona (14 Ariz. Admin. Register 2978, August 1, 2008), California (Cal Code Regs. Title 26, § 22-64444), Delaware (Del. Admin. Code Title 16, § 4462), Connecticut (Conn. Agencies Regs. § 19-13-B102), Florida (Fla. Admin. Code R. Chap. 62–550), Maine (10 144 Me. Code R. Chap. 231), Massachusetts (310 Code Mass. Regs. § 22.00), Michigan (Mich. Admin. Code r.299.44 and r.299.49, 2017), Minnesota (Minn R. Chap. 4720), New Jersey (7:10 N.J Admin. Code § 5.2), Pennsylvania (25 Pa. Code § 109.202), Rhode Island (Rules and Regulations Pertaining to Public Drinking Water R46-13-DWQ), Texas (30 Tex. Admin. Code § 290.104).	
State PELs	Alaska (Alaska Administrative Code 8 AAC 61.1100 and incorporates OSHA 1910.1000), California (Cal Code Regs. Title 8, § 5155), Connecticut (Connecticut Administrative Code), Hawaii (Hawaii Administrative Rules Section 12-60-50), Illinois (Illinois Administrative Code 820 ILCS 219 and incorporates OSHA 1910.1000), Indiana (Indiana Administrative Code 620 article 1−30, Iowa (Iowa Administrative Code IAC 10/21/98), Kentucky (Kentucky Administrative Regulations 803 KAR chapter 2, Maryland (Code of Maryland Regulations COMAR 09.12.32), Minnesota (Minnesota Administrative Rules 5206.0400), Nevada (Nevada Administrative Code Chapter 618), New Jersey (New Jersey Administrative Code 8:59-4.2), New Mexico (New Mexico Administrative Code Title 20, New York	PEL: 1 ppm STEL: 2 ppm

State Actions	Description of Action[a]	
	(New York Code, Rules, Regulations Title 12 § 800.5), North Carolina (North Carolina Administrative Code 13 NCAC 07F), South Carolina (South Carolina Code of Law Title 41 Chapter 15, Tennessee (Tennessee Administrative Code 0800–01–01–07, Utah (Utah Administrative Code Title R614), Vermont (Vermont Statutes Online Title 21 Chapter 3, 201–232, Virginia (Virginia Administrative Code 4VAC25–40–720, Washington (Washington Administrative Code WAC 296–841–20025, Wyoming (Wyoming Administrative Rule 053–26 Wyo. Code R 26–1	
	Massachusetts (https://www.mass.gov/info–details/massdep–ambient–air–toxics–guidelines	TEL: 1 ug/m^3
	Oregon (Oregon Administrative Rules Chapter 437	TWA: 50 ppm STEL: 200 ppm
State Right-to-Know Acts	Massachusetts (105 Code Mass. Regs. § 670.000 Appendix A), New Jersey (N.J.A.C. 7:1G) and Pennsylvania (P.L. 734, No. 159 and 34 Pa. Code § 323).	
Chemicals of High Concern to Children	Several states have adopted reporting laws for chemicals in children's products containing 1,2-dichloroethane, including Maine (38 MRSA Chapter 16-D), Minnesota (Toxic Free Kids Act Minn. Stat. 116.9401 to 116.9407).	
Volatile Organic Compound (VOC) Regulations for Consumer Products	Many states regulate 1,2-dichloroethane as a VOC. These regulations may set VOC limits for consumer products and/or ban the sale of certain consumer products as an ingredient and/or impurity. Regulated products vary from state to state, and could include California (Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Articles 1, 2, 3 and 4), Delaware (Adm. Code Title 7, 1141), Illinois (35 Adm Code 223), New Hampshire (Env-A 4100), among other products.	
Other	California listed 1,2-dichloroethane on Proposition 65 in 1987 due to cancer. (Cal Code Regs. Title 27, § 27001). 1,2-dichloroethane is listed as a Candidate Chemical under California's Safer Consumer Products Program (Health and Safety Code § 25252 and 25253). California issued a Health Hazard Alert for 1,2-dichloroethane (Hazard Evaluation System and Information Service, 2016). California lists 1,2-dichloroethane as a designated priority chemical for biomonitoring (California SB 1379). 1,2-dichloroethane is on the MA Toxic Use Reduction Act (TURA) list of 2019 (301 CMR 41.03).	

[a] All hyperlinks/URLs included in this table last accessed on November 12, 2023.

B.3 International Laws and Regulations

Table_Apx B-3. International Laws and Regulations for 1,2-Dichloroethane

Country / Organization	Requirements and Restrictions
World Health Organization (WHO)	WHO Guidelines for drinking water quality concentrations of 1,2-dichloroethane in drinking water estimated to be associated with excess risks of 10E−4, 10E−5, and 10E−6 are 300, 30, and 3 µg/L, respectively (WHO, 1993).
Canada	1,2-dichloroethane is on the Canadian List of Toxic Substances (CEPA 1999 Schedule 1) and is on the Domestic Substances List (Government of Canada. Managing substances in the environment. Substances search. Database accessed October 30, 2024). Other regulations include: Canada's National Pollutant Release Inventory (NPRI). Environmental Emergency Regulations, 2019 (SOR/2019-51)
European Union	On August 14, 2014, 1,2-dichloroethane was added to Annex XIV of REACH (Authorisation List) with a sunset date of November 22, 2017. After the sunset date, only persons with approved authorization applications may continue to use the chemical. Eighteen applications for authorization have been received and decided, for uses as an industrial solvent, emulsifying and swelling agent, and reaction medium (European Chemicals Agency (ECHA) database; accessed October 31, 2024). Directive 2010/75/EU on Industrial Emissions
Australia	1,2-Dichloroethane was assessed under both Human Health and Environment Tier II of the Inventory Multi-Tiered Assessment and Prioritisation (IMAP). Uses reported in Australia include as a component of solvents to remove grease, resins, glue and dirt; and as an anti-knock component of leaded petrol (previous use only); as a solvent in the manufacture of polystyrene and styrene butadiene rubber (SBR) latex. International uses include in solvents; in varnish and finish removers, paints, coatings and adhesives for professional use (European product registers contain entries of products with the chemical as an ingredient. The product types are paints and lacquers (concentrations between 1–100%), adhesives (concentrations between 10–50%) and fertilizers (concentrations below 1%); as a component in leaded gasoline; as a chemical intermediate in the production of vinyl choride monomer which in turn is used in the manufacture of polymers; and as a chemical intermediate in the manufacture of other chlorinated solvents. (NICNAS, Ethane, 1,2-dichloro-: Human health tier II assessment, 22 March 2013; accessed October 31, 2024).

<table>
<tr><th>Country / Organization</th><th colspan="2">Requirements and Restrictions</th></tr>
<tr><td>Japan</td><td colspan="2">1,2-dichloroethane 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)
Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR-SDS Law)
Industrial Safety and Health Act (ISHA)
Air Pollution Control Act
Water Pollution Control Act
Soil Contamination Countermeasures Act
Food Sanitation Act
Fire Service Act
(National Institute of Technology and Evaluation [NITE] Chemical Risk Information Platform [CHRIP]; accessed October 31, 2024).</td></tr>
<tr><td>Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade</td><td colspan="2">In February 2001, 1,2-dichloroethane was added to the Rotterdam Convention’s list of chemicals under Annex III. The chemicals listed in Annex III include pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by two or more Parties and which the Conference of the Parties has decided to subject to the PIC procedure, which includes, among other things, the exercise of export controls. (UNEP/FAO/RC/DGD/GUID/EDC/2005)</td></tr>
<tr><td rowspan="10">Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) GENTIS (accessed October 27, 2025) Internation Limit Values for Chemical Agents Database</td><td>Australia, Canada (Ontario), Japan, Singapore, South Korea</td><td>TWA: 10 ppm</td></tr>
<tr><td>Austria</td><td>TWA: 2 ppm
STEL: 8 ppm</td></tr>
<tr><td>Belgium, European Union, France, Ireland, Italy, Latvia, Romania, Spain</td><td>TWA: 2 ppm</td></tr>
<tr><td>Canada (Québec), Denmark</td><td>TWA: 1 ppm
STEL: 2 ppm</td></tr>
<tr><td>Finland, Sweden</td><td>TWA: 1 ppm
STEL: 5 ppm</td></tr>
<tr><td>Hungary, Poland</td><td>TWA: 8.2 mg/m^3</td></tr>
<tr><td>New Zealand, United Kingdom</td><td>TWA: 5 ppm</td></tr>
<tr><td>Norway</td><td>TWA 0.25 ppm</td></tr>
<tr><td>People’s Republic of China</td><td>TWA: 7 mg/m^3
STEL: 15 mg/m^3</td></tr>
<tr><td>South Africa</td><td>TWA: 20 ppm</td></tr>
</table>

Country / Organization	Requirements and Restrictions	
	Switzerland	TWA: 52 ppm
	The Netherlands	TWA: 7 mg/m^3

B.4 Assessment History

Table_Apx B-4. Assessment History of 1,2-Dichloroethane

Authoring Organization	Publication[a]
EPA publications	
U.S. EPA, Integrated Risk Information System (IRIS)	IRIS Summary. 1,2-dichloroethane; CASRN 107-06-2
U.S. EPA, National Service Center for Environmental Publications (NSCEP)	Exposure and Risk Assessment {for} Dichloroethanes 1,1-dichloroethane, 1,2-dichloroethane
U.S. EPA, Office of Chemical Safety and Pollution Prevention (OCSPP)	*Final Scope of the Risk Evaluation for 1,2-Dichloroethane CASRN 107-06-2* (2020)
U.S. EPA, Office of Pollution Prevention and Toxics (OPPT)	Chemview (TSCA submissions – chemical test rule data and substantial risk reports)
U.S.EPA, Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development	Provisional Peer Reviewed Toxicity Values for 1,2-dichloroethane (CASRN 107-06-2)
Other U.S.−based organizations	
Agency for Toxic Substances and Disease Registry (ATSDR)	Toxicological Profile for 1,2-Dichloroethane CAS#: 107-06-2, July 2024
Centers for Disease Control and Prevention (CDC)	National Report on Human Exposure to Environmental Chemicals
National Cancer Institute (NCI)	National Cancer Institute (NCI) 1978. Bioassay of 1,2-Dichloroethane for Possible Carcinogenicity (CAS No. 107-06-2). Technical Report Series No. 55 (NCI-CG-TR-55). U.S. Department of Health, Education, And Welfare.
NCI	National Cancer Institute (NCI) 1978. Bioassay of 1,2-Dichloroethane for Possible Carcinogenicity. Bethesda, MD: National Cancer Institute. NIH publication No. 78−1361
National Institute for Occupational Safety and Health (NIOSH)	Current Intelligence Bulletin 27: Chloroethanes Review of Toxicity
NIOSH	Occupational health guidelines for 1,1-dichloroethane. Occupational health guidelines for chemical hazards. Washington, DC: US Department of Labor, National Institute for Occupational Safety and Health, 1–4. 1978.

Authoring Organization	Publication[a]
NIOSH	1,2-Dichloroethane. NIOSH Pocket Guide to Chemical Hazards. Atlanta, GA: National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. 2015.
National Toxicology Program (NTP), National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH)	1,2-Dichloroethane: Target Organs and Levels of Evidence for TR-055
Occupational Safety and Health Administration (OSHA)	Occupational Exposure to Methylene Chloride OSHA (1997)
International	
ECHA European Union Risk Assessment Report	https://echa.europa.eu/information-on-chemicals/information-from-existing-substances-regulation
Government of Canada, Environment Canada, Health Canada	Chemicals at a Glance (fact sheets) International Resources Assessment or Related Document

[a] All hyperlinks/URLs included in table last accessed on November 12, 2025.

Appendix C LIST OF TECHNICAL SUPPORT DOCUMENTS AND SUPPLEMENTAL FILES

This appendix includes a list and citations for all technical support documents (TSDs) and supplemental files included in the draft risk evaluation for 1,2-dichloroethane. These include discipline-specific assessments, systematic review results, risk calculations, modeling outputs, and public communication documents. Files are numbered to correspond with the filenames uploaded to the docket: EPA-HQ-OPPT-2018-0427.

2. *Summary of and Response to External Peer Review and Public Comments on the Risk Evaluation for 1,1-Dichloroethane and Human Health Hazard Technical Support Document for 1,2-Dichloroethane* (U.S. EPA, 2025bm)

Associated **Technical Support Documents** – Provide additional details and information on physical chemistry, fate, exposure, hazard, and risk assessments.

3. *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b)

4. *Draft Chemistry and Fate and Transport Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025p)

5. *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag)

6. *Draft Occupational Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025at)

7. *Draft Consumer Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025q)

8. *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj)

9. *Draft Environmental Media Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025af)

10. *Draft Environmental Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ad)

11. *Draft Environmental Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ae)

12. *Draft Byproducts Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025l)

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.

13. *Draft Systematic Review Protocol for 1,2-Dichloroethane* (U.S. EPA, 2025bd) – In lieu of an update to the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances: A Generic TSCA Systematic Review Protocol with Chemical-Specific Methodologies* (also referred to as "2021 Draft Systematic Review Protocol" this systematic review protocol for the *Draft Risk Evaluation for 1,2-Dichloroethane* 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 "1,2-Dichloroethane Systematic Review Protocol."

14. *Draft Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties for 1,2-Dichloroethane* (U.S. EPA, 2025w) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. 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 "1,2-dichloroethane Data Quality Evaluation and Data Extraction Information for Physical and Chemical Properties."

15. *Draft Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport for 1,2-Dichloroethane* (U.S. EPA, 2025u) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Quality Evaluation and Data Extraction Information for Environmental Fate and Transport."

16. *Draft Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025v) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure."

17. *Draft Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025y) – Provides a compilation of tables for the data extraction for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Extraction Information for General Population, Consumer, and Environmental Exposure."

18. *Draft Data Extraction Information for General Population, Consumer, and Environmental Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025s) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure."

19. *Draft Data Quality Evaluation Information for Human Health Hazard Animal Toxicology for 1,2-Dichloroethane* (U.S. EPA, 2025z) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Quality Evaluation Information for Human Health Hazard Animal Toxicology."

20. *Draft Data Quality Evaluation Information for Human Health Hazard Epidemiology for 1,2-Dichloroethane* (U.S. EPA, 2025aa) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. 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 "1,2-Dichloroethane Data Quality Evaluation Information for Human Health Hazard Epidemiology."

21. *Draft Data Quality Evaluation Information for Environmental Hazard for 1,2-Dichloroethane* (U.S. EPA, 2025x) – Provides a compilation of tables for the data quality evaluation information for 1,2-dichloroethane. Each table shows the data point, dataset, 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 "1,2-Dichloroethane Data Quality Evaluation Information for Environmental Hazard."

22. *Draft Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology for 1,2-Dichloroethane* (U.S. EPA, 2025r) – Provides a compilation of tables for the data extraction for 1,2-dichloroethane. Each table shows the data point, set, or information element that was extracted from a data source that has information relevant for the evaluation human health hazard animal toxicology and epidemiology information. In contrast with other risk evaluations, this file contains dose-response information for every assessed endpoint within each animal toxicology study. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Extraction Information for Environmental Hazard and Human Health Hazard Animal Toxicology and Epidemiology."

23. *Draft Data Quality Evaluation and Data Extraction Information for Dermal Absorption for 1,2-Dichloroethane* (U.S. EPA, 2025t) – Provides a compilation of tables for the data extraction and data quality evaluation information for 1,2-dichloroethane. 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 Dermal Absorption. This supplemental file may also be referred to as the "1,2-Dichloroethane Data Quality Evaluation and Data Extraction Information for Dermal Absorption."

Associated **Supplemental Information Document** – Provide additional details and information on fate, exposure, hazard, and risk assessments.

24. *Draft Water Releases for 1,2-Dichloroethane* (U.S. EPA, 2025bf)

25. *Draft Air Releases for 1,2-Dichloroethane* (U.S. EPA, 2025g)

26. *Draft Land Releases for 1,2-Dichloroethane (*U.S. EPA, 2025ap*)*

27. *Draft Application of Adhesives Release Model for 1,2-Dichloroethane* (U.S. EPA, 2025i)

28. *Draft Aerosol Products Release Model for 1,2-Dichloroethane* (U.S. EPA, 2025f)

29. *Draft Non-aerosol Cleaning and Degreasing Release Model for 1,2-Dichloroethane* (U.S. EPA, 2025ar)
30. *Draft Repackaging Release Model for 1,2-Dichloroethane* (U.S. EPA, 2025av)

31. *Draft Laboratory Use Release Model for 1,2-Dichloroethane* (U.S. EPA, 2025ao)

32. *Draft Aerosol Products Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2025e)

33. *Draft Repackaging Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2025au)

34. *Draft Number of Sites for 1,2-Dichloroethane* (U.S. EPA, 2025as)

35. *Draft Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025ax)

36. *Draft Byproducts Releases for 1,2-Dichloroethane* (U.S. EPA, 2025n)

37. *Draft Byproducts Risk Calculator for Occupational Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025o)

38. *Draft Estimates of Number of Workers and ONUs Model for 1,2-Dichloroethane* (U.S. EPA, 2025ah)

39. *Draft Byproducts General Population Exposures for 1,2-Dichloroethane* (U.S. EPA, 2025m)

40. *Draft Ambient Monitoring Technology Information Center (AMTIC) Monitoring Data 2015 to 2020 for 1,2-Dichloroethane* (U.S. EPA, 2025h)

41. *Draft Mammalian TRV Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025aq)

42. *Draft Avian Hazard Value Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025k)

43. *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb)

44. *Draft Supplemental Information on EPI Suite Modeling Results in the Fate Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025bc)

45. *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az)

46. *Draft AERMOD Input Specifications for 1,2-Dichloroethane* (U.S. EPA, 2025b)

47. *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba)

48. *Draft Fish Ingestion Risk Calculator for 1,2-Dichloroethane* (U.S. EPA, 2025ai)

49. *Draft Drinking Water Exposure Estimates for 1,2-Dichloroethane* (U.S. EPA, 2025ac)

50. *Draft Risk Calculator for Consumer Exposure for 1,2-Dichloroethane* (U.S. EPA, 2025aw)
51. *Draft Dermal Monte Carlo Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2025ab)

52. *Draft Water Quality Portal Data for 1,2-Dichloroethane* (U.S. EPA, 2025be)

53. *Draft AERMOD TRI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2025d)

54. *Draft AERMOD NEI Input Files for 1,2-Dichloroethane* (U.S. EPA, 2025c)

55. *Draft Human Health Hazard Exposure Response Array Data and Figures for 1,2-Dichloroethane* (U.S. EPA, 2025am)

56. *Draft AERMOD Generic Facilities/Sites Files for 1,2-Dichloroethane* (U.S. EPA, 2025a)

57. *Draft HEM Input and Output Files for 1,2-Dichloroethane* (U.S. EPA, 2025ak)

58. *Draft in vitro Dermal Absorption Study Calculation for 1,2-Dichloroethane* (U.S. EPA, 2025an)

59. *OPPT/ECRAD Review of OECD 428 Report Submission to EPA Test Order for 1,2-Dichloroethane (CAS No 107-06-2)* (U.S. EPA, 2025bi)

60. *Draft HEM Input and Output Files for 1,2-Dichloroethane-Byproducts* (U.S. EPA, 2025al)

61. *Risk Evaluation for 1,1-Dichloroethane – Supplemental Information File: in vitro Dermal Absorption Study Analysis* (U.S. EPA, 2025bk)

62. *Risk Evaluation for 1,1-Dichloroethane – Supplemental Information File: in vitro Dermal Absorption Study Calculation Sheet* (U.S. EPA, 2025bl)

63. *OPPT/ECRAD Review of OECD 428 Report Submission to EPA Test Order for 1,1-Dichloroethane (CAS No 75-34-3)* (U.S. EPA, 2025bh)

64. *Draft Application of Lubricants and Greases Exposure Model for 1,2-Dichloroethane* (U.S. EPA, 2025j)

Appendix D UPDATES TO THE 1,2-DICHLOROETHANE CONDITIONS OF USE TABLE

D.1 Additions and Name Changes to Conditions of Use Based on Updated 2020 CDR-Reported Data and Stakeholder Engagement

After publication of the final scope (U.S. EPA, 2020b), EPA received updated submissions under the 2020 CDR-reported data. In addition to new submissions received under the 2020 CDR, some industry code names were updated for the 2020 CDR reporting cycle. Therefore, the Agency is amending the description of certain 1,2-dichloroethane COUs based on those new submissions and new industry code names. Also, EPA received information from stakeholders clarifying certain conditions of use (COUs) of 1,2-dichloroethane. 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.

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	Occurred Change	Revised Subcategory in the 2024 Draft Risk Evaluation
Processing, As a reactant	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing	Added "All other basic inorganic chemical manufacturing"	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing; all other basic inorganic chemical manufacturing
Processing, Incorporation into formulation, mixture, or reaction product	Processing aids: specific to petroleum production	Added "Plastic material and resin manufacturing"	Processing aids: specific to petroleum production; plastic material and resin manufacturing
Processing, Incorporation into formulation, mixture, or reaction product	N/A	Added "Processing, incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing"	Adhesives and sealants; lubricants and greases; oxidizing/reducing agents; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing
Processing, Repackaging	N/A	Added "Processing, repackaging" subcategory	Repackaging
Industrial Use, Lubricants and Greases	Paste lubricants and greases	Changed to "Solid film lubricants and greases"	Solid film lubricants and greases
Industrial Use, Oxidizing/ reducing agents	Oxidation inhibitor in controlled oxidative chemical reactions	Changed category to "Process regulator" and changed subcategory to "*e.g.* catalyst moderator; oxidation inhibitor"	*e.g.*, Catalyst moderator; oxidation inhibitor
Industrial Use, Solvents (for cleaning and degreasing)	A component of degreasing and cleaning solvents	Changed to "Degreasing and cleaning solvents"	Degreasing and cleaning solvents
Industrial Use, Other use	N/A	Added "Other use – process solvent"	Process solvent
Commercial Use, Other use	Laboratory chemical (*e.g.*, reagent)	Deleted "(*e.g.*, reagent)"	Laboratory chemical

The changes based on CDR reporting, research, or stakeholder activity are listed below:

- "All other basic inorganic chemical manufacturing" was added to "Processing, as a reactant, intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing" based on 2020 CDR reporting.
- "Plastics and resin manufacturing" was added to "Processing, incorporation into formulation, mixture, or reaction product – processing aids: specific to petroleum production" based on input from a stakeholder.
- "Processing, incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing" was inadvertently omitted from the final scope. This COU is needed to account for the upstream processing of such formulations that include 1,2-dichloroethane.
- "Processing, Repackaging" was inadvertently omitted from the final scope. This COU is needed to account for the transfer of 1,2-dichloroethane from one container to another.
- "Paste lubricants and greases" was changed to "solid film lubricants and greases" in response to input from stakeholders.
- "Industrial Use, Oxidizing/reducing agents – Oxidation inhibitor in controlled oxidative chemical reactions" was changed to "Industrial use, process regulator − e.g., catalyst moderator; oxidation inhibitor" for accuracy and to accommodate additional process regulator uses in stakeholder comments. "A component of degreasing and cleaning solvents" was changed to "Degreasing and cleaning solvents" for clarity.
- "(e.g,. reagent)" was deleted from "Laboratory chemical" for clarity, given that 1,2-dichlorethane may not always be a reagent when used as a laboratory chemical.

D.2 Activities Determined Not to Be Conditions of Use

When developing this draft risk evaluation, EPA concluded that a subcategory of the conditions of use listed in the final scope (U.S. EPA, 2020b) was not subject to TSCA and should be removed. Section 2.2.2 of the 2020 final scope document explained that EPA determined that several uses of 1,2-dichloroethane were outside the scope of TSCA, such as pesticidal uses regulated under FIFRA. Among other things, TSCA section 3(2) excludes from the "chemical substance" definition "any pesticide (as defined in [FIFRA]) when manufactured, processed, or distributed in commerce for use as a pesticide," "tobacco or any tobacco product," and "any food, food additive, drug, cosmetic, or device (as such terms are defined in…the Federal Food, Drug, and Cosmetic Act (FFDCA) . . .) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device" (TSCA section 3(2)(B)(ii), (iii), (vi)). When developing this draft risk evaluation, EPA concluded that a subcategory of the conditions of use listed in the final scope is excluded from the TSCA section 3(2) definition of "chemical substance". Therefore, EPA has removed this subcategory from the risk evaluation. Table_Apx D-2 summarizes the change to the COU subcategory descriptions.

Table_Apx D-2. Subcategory Removed from the Risk Evaluation

Life Cycle Stage and Category	Original Subcategory in the Final Scope Document	Occurred Change	Revised Subcategory in the 2024 Draft Risk Evaluation
Commercial Use, Other use	Embalming Fluid	Removed	N/A

This change was made from the final scope of the risk evaluation for the following reasons:

- In Section 2.2.2 of the final scope (U.S. EPA, 2020b), EPA explained that "TSCA Section 3(2) also excludes from the definition of 'chemical substance' 'any food, food additive, drug, cosmetic, or device (as such terms are defined in Section 201 of the Federal Food, Drug, and Cosmetic Act [21 U.S.C. 321]) when manufactured, processed, or distributed in commerce for use as a food, food additive, drug, cosmetic, or device' as well as 'any pesticide (as defined in the Federal Insecticide, Fungicide, and Rodenticide Act [7 U.S.C. 136 et seq.]) when manufactured, processed, or distributed in commerce for use as a pesticide.'" EPA has determined that the commercial use of 1,2-dichloroethane in embalming fluid is a non-TSCA use.
- EPA notes that the processing of such an embalming fluid is addressed in the added COU "processing – incorporated into formulation, mixture, or reaction product – adhesives and sealants; lubricants and greases, oxidizing/reducing agents, degreasing and cleaning solvents; pesticides," because "pesticides" encompasses embalming fluid.

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.

E.1 Manufacturing – Domestic Manufacture

Domestic manufacture means to manufacture or produce 1,2-dichloroethane within the Unites States, including to manufacture 1,2-dichloroethane as a byproduct. At a typical manufacturing site, 1,2-dichloroethane can be manufactured by the vapor- or liquid-phase chlorination of ethylene. For purposes of the 1,2-dichloroethane risk evaluation, these byproducts include 1,1-dichloroethane, trichloroethylene, perchloroethylene, methylene dichloride, and carbon tetrachloride as byproducts during the manufacture of 1,2-dichloroethane. This draft risk evaluation does not include the manufacture of 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene produced during the manufacture of 1,2-dichloroethane (those exposures will be assessed in the risk evaluations for 1,1,2-trichloroethane and *trans*-1,2-dichloroethylene, respectively).

E.2 Manufacturing – Importing

Import refers to the import of 1,2-dichloroethane into the customs territory of the United States. This COU includes loading/unloading and repackaging (but not transport) associated with the import of 1,2-dichloroethane. In general, chemicals may be imported into the United States in bulk via water, air, land, and intermodal shipments.

E.3 Processing – As a Reactant – Intermediate in: Petrochemical Manufacturing; Plastic Material and Resin Manufacturing; All Other Basic Organic Chemical Manufacturing; All Other Basic Inorganic Chemical Manufacturing

Processing as a reactant or intermediate is the use of 1,2-dichloroethane as a feedstock in the production of another chemical via a chemical reaction in which 1,2-dichloroethane is consumed to form the product, though trace amounts may be present in the product as an impurity. Processing as an intermediate in petrochemical manufacturing, plastic material and resin manufacturing, and all other basic organic chemical manufacture includes the use of 1,2-dichloroethane as an intermediate for the manufacture of other chlorinated solvents, mainly vinyl chloride.

E.4 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Fuels and Fuel Additives: All Other Petroleum and Coal Products Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane 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 in petroleum and coal products manufacturing. This includes the incorporation of 1,2-dichloroethane into a fuel additive for combustion research.

E.5 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Processing Aids: Specific to Petroleum Production; and Plastic Material and Resin Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane 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 processing aid in petroleum production or in plastic material and resin manufacturing. Processing aids are used to help manufacture or synthesize another chemical substance but are not intended to be part of the final product. As such they are not present in the product, or only present as an impurity in trace quantities.

E.6 Processing – Incorporated into a Formulation, Mixture, or Reaction Product – Adhesives and Sealants; Lubricants and Greases; Process Regulators; Degreasing and Cleaning Solvents; Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing

This COU refers to the preparation of a product; that is, the incorporation of 1,2-dichloroethane 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, this COU refers to such formulation of adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; and pesticide, fertilizer, and other agricultural chemical manufacturing. “Pesticides” includes but is not limited to embalming fluid.

E.7 Processing – Repackaging

Repackaging refers to the preparation of 1,2-dichloroethane 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 1,2-dichloroethane from a bulk container into smaller containers. This COU would not apply to the relabeling or redistribution of a chemical substance without removing the chemical substance from the original container in which it was supplied.

E.8 Processing – Recycling

This COU refers to the process of treating generated waste streams (*i.e.*, which would otherwise be disposed of as waste) containing 1,2-dichloroethane that are collected, either on-site or at a third-party site, for commercial purpose.

E.9 Distribution in Commerce

For purposes of assessment in this draft risk evaluation, distribution in commerce consists of the transportation associated with the moving of 1,2-dichloroethane. EPA expects 1,2-dichloroethane to be transported from manufacturing sites to downstream processing and repackaging sites, and/or for final disposal of 1,2-dichloroethane. 1,2-Dichloroethane may be transported in pure liquid form and in various liquid formulations with a range of potential 1,2-dichloroethane concentrations. For the purposes of TSCA, “distribution in commerce” and “distribute in commerce” are defined under TSCA section 3(5).

E.10 Industrial Use – Adhesives and Sealants

This COU refers to 1,2-dichloroethane as it is used in various industrial sectors as a component of adhesive or sealant mixtures, meaning the use of 1,2-dichloroethane after it has already been incorporated into an adhesive and/or sealant product or mixture, as opposed to when it is used upstream, (*e.g.*, when 1,2-dichloroethane is processed into the adhesive and sealant formulation).

E.11 Industrial Use – Functional Fluids (Closed Systems) – Heat Transferring Agent

This COU refers to the use of 1,2-dichloroethane as a component in a functional fluid as a heat transferring agent. This includes the use of 1,2-dichloroethane in a supplemental engine coolant additive. This is a use of 1,2-dichloroethane after it has already been incorporated into the heat transferring agent, as opposed to when it is used upstream (*e.g.*, when 1,2-dichloroethane is processed into the heat transferring agent).

E.12 Industrial Use – Lubricants and Greases – Solid Film Lubricants and Greases

This COU refers to the use of 1,2-dichloroethane as a component in solid film lubricants and greases, including products that prevent metal to metal contact when used in the presence of conventional lubricants as well as low-friction and anti-knock coatings for the aerospace industry. This is a use of 1,2-dichloroethane after it has already been incorporated into the lubricant or grease, as opposed to when it is used upstream (*e.g.*, when 1,2-dichloroethane is processed into the lubricant or grease).

E.13 Industrial Use – Other Use – Process Solvent

This COU refers to the use of 1,2-dichloroethane as a process solvent in chemical reactions, including a proprietary use in pesticide, fertilizer, and other agricultural chemical manufacturing.

E.14 Industrial Use – Process Regulator – *e.g.*, Catalyst moderator Oxidation inhibitor

This COU refers to the use of 1,2-dichloroethane as a process regulator. This includes use as an oxidation inhibitor in controlled oxidative chemical reactions and use in chemical reactions to moderate a catalyst. This is a use of 1,2-dichloroethane after it has already been incorporated into a process regulator product, as opposed to when it is used upstream (*e.g.*, when 1,2-dichloroethane is processed into the process regulator product).

E.15 Industrial Use – Solvents for Cleaning and Degreasing – Degreasing and Cleaning Solvents

This COU refers to the use of 1,2-dichloroethane as a component of degreasing and cleaning solvents, including as a process cleaner. These degreasing and cleaning solvents may be spray-applied (aerosolized) in liquid or vapor form, such as vapor degreasing. This is a use of 1,2-dichloroethane after it has already been incorporated into the degreasing or cleaning solvent, as opposed to when it is used upstream (*e.g.*, when 1,2-dichloroethane is processed into the degreasing or cleaning solvent).

E.16 Commercial Use – Plastic and Rubber Products

This COU is referring to the commercial use of 1,2-dichloroethane in some plastic and rubber products.

E.17 Commercial Use – Fuels and Related Products

This COU is referring to the commercial use of 1,2-dichloroethane as a fuel additive, including for combustion research.

E.18 Commercial Use – Other Uses – Laboratory Chemical

This COU refers to the use of 1,2-dichloroethane as a laboratory chemical, such as a chemical standard for research, equipment calibration and sample preparation, including as a reference material during analysis. Note that embalming fluids; products used to preserve animal or animal organ specimens in mortuaries, laboratories, hospitals, museums and institutions of learning; and products used to preserve the integrity of milk, urine, blood, or other body fluids for laboratory analysis are excluded from the TSCA section 3(2) definition of "chemical substance" when manufactured, processed, or distributed in commerce. Such uses would not be considered laboratory chemicals under TSCA.

E.19 Consumer Use – Plastic and Rubber Products

This COU refers to the use of 1,2-dichloroethane in various plastics and rubber products for consumers, such as molded plastic used in decorative ornaments or squishy toys.

E.20 Disposal

Each of the conditions of use of 1,2-dichloroethane may generate waste streams of the chemical that are collected and transported to third-party sites for disposal, treatment, or recycling. For purposes of this draft 1,2-dichloroethane risk evaluation, this COU refers to the 1,2-dichloroethane in a waste stream that is collected from facilities and commercial sites and is unloaded at and treated or disposed at third-party sites. This COU also encompasses 1,2-dichloroethane contained in wastewater discharged by occupational users to a POTW or other, non-POTWs for treatment, as well as other wastes. 1,2-Dichloroethane is expected to be released to other environmental media, such as introductions of biosolids to soil or migration to water sources or through waste disposal (*e.g.*, disposal of formulations containing 1,2-dichloroethane or transport containers). Disposal may also include destruction and removal by incineration. Recycling of 1,2-dichloroethane and 1,2-dichloroethane-containing products is considered a different COU. Environmental releases from manufacturing and processing sites that treat or dispose onsite waste are assessed in each COU.

Appendix F DRAFT OCCUPATIONAL EXPOSURE VALUE DERIVATION AND ANALYTICAL METHODS USED TO DETECT 1,2-DICHLOROETHANE

EPA has calculated an 8-hour time-weighted average (TWA) existing chemical occupational exposure value to summarize the OES and sensitive health endpoints into a single value. This calculated value may be used to support risk management efforts for 1,2-dichloroethane under TSCA section 6(a), 15 U.S.C. § 2605. EPA calculated the value rounded to 0.014 ppm (0.058 mg/m^3) for inhalation exposures to 1,2-dichloroethane as an 8-hour TWA and for consideration in workplace settings (see Appendix F.1 below) based on the lifetime cancer inhalation unit risk (IUR) for a combined/multi-tumor model.

TSCA requires risk evaluations to be conducted without consideration of cost and other non-risk factors; therefore, this most sensitive occupational exposure value represents a risk-only number. If risk management for 1,2-dichloroethane is implemented following public release of the final risk evaluation, EPA may consider cost and other non-risk factors such as technological feasibility, the availability of alternatives, and the potential for critical or essential uses. Any existing chemical exposure limit (ECEL) 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 non-risk factors consistent with TSCA section 6(c).

This calculated value for 1,2-dichloroethane represents the exposure concentration below which exposed workers and occupational non-users (ONUs) are not expected to exhibit any appreciable risk of adverse toxicological outcomes. This value accounts for potentially exposed and susceptible subpopulations (PESS). The value is derived based on the most sensitive human health effect (*i.e.*, cancer) supported by the weight of scientific evidence. This value is expressed relative to benchmarks and standard occupational scenario assumptions of 8 hours per day, 5 days per week exposures, for a total of 250 days exposure per year across a 40-year working life.

All hazard values used in these calculations are based on non-cancer, human equivalent concentrations (HECs), associated uncertainty factor (UF) derivations, and the inhalation unit risk (IUR) value from the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b).

EPA expects that at the occupational exposure value of 0.014 ppm (0.058 mg/m^3) for lifetime exposure, workers and ONUs would be protected against non-cancer health effects for acute, intermediate, and chronic durations. EPA has also separately calculated a short-term occupational exposure value (STEV) for 1,2-dichloroethane (see Appendix F.3 for details).

Of the identified occupational monitoring data for 1,2-dichloroethane, there have been measured workplace air concentrations below the calculated exposure value. A summary table of available monitoring methods from the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and EPA is included in Appendix F.2. That table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for 1,2-dichloroethane. The calculated exposure value is above the limit of detection (LOD) and limit of quantification (LOQ) using at least one of the monitoring methods identified.

OSHA has set a permissible exposure limit (PEL) as an 8-hour TWA for 1,2-dichloroethane of 50 ppm in 1979 (https://www.osha.gov/annotated-pels; accessed November 12, 2025). The California Division of Occupational Safety and Health (Cal/OSHA) has set an 8-hour TWA for 1,2-dichloroethane of 1 ppm, a short-term exposure limit (STEL) of 2 ppm, and a ceiling limit of 200 ppm. However, as noted on OSHA's website, "OSHA recognizes that many of its permissible exposure limits (PELs) are outdated and inadequate for ensuring protection of worker health. Most of OSHA's PELs were issued shortly after adoption of the Occupational Safety and Health (OSH) Act in 1970 and have not been updated since that time." The OSHA PEL for 1,2-dichloroethane was established in 1979. In addition, OSHA's PEL must undergo both risk assessment and feasibility assessment analyses before selecting a level that will substantially reduce risk under the Occupational Safety and Health Act. EPA's calculated exposure value is a lower value and is based on newer information and analysis from this draft risk evaluation.

Other governmental agencies and independent groups have also set recommended exposure limits (accessed November 12, 2025), established for 1,2-dichloroethane. The American Conference of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value (TLV) at 10 ppm TWA in 1979. This chemical also has a NIOSH Recommended Exposure Limit (REL) of 1 ppm TWA and a 15-minute STEL of 2 ppm and a revised Immediately Dangerous to Life or Health (IDLH) value of 50 ppm.

F.1 Occupational Exposure Value Calculations

This section presents the calculations used to estimate the occupational exposure values using inputs derived in this draft risk evaluation. Multiple values are presented below for hazard endpoints based on different exposure durations. For 1,2-dichloroethane, the most sensitive occupational exposure value is based on cancer following lifetime exposure and the resulting 8-hour TWA is rounded to 0.014 ppm. The human health hazard values (HECs, IUR) used in the equations are derived in this draft risk evaluation and provided in the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b).

Most Sensitive Occupational Exposure Value (Lifetime Cancer)

The EV_{cancer} is the concentration at which the extra cancer risk is equivalent to the benchmark cancer risk of $1{\times}10^{-4}$:

$$EV_{cancer} = \frac{Benchmark_{Cancer}}{IUR} \times \frac{AT_{IUR}}{ED \times EF \times WY} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{1X10^{-4}}{2.9 \times 10^{-2}\ per\ ppm} \times \frac{24\frac{h}{d} \times \frac{365d}{y} \times 78y}{8\frac{h}{d} \times \frac{250d}{y} \times 40y} \times \frac{0.6125\,\frac{\mathrm{m}^3}{h}}{1.25\,\frac{\mathrm{m}^3}{h}} = \mathbf{0.014\ ppm}$$

$$EV_{cancer}\ (mg/m^3) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.014\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{0.058\ mg/m^3}$$

Where:

Molar Volume	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW	=	Molecular weight of 1,2-dichloroethane (98.96 g/mole)

Acute Non-Cancer Occupational Exposure Value

The acute occupational exposure value (EV_{acute}) was calculated as the concentration at which the acute margin of exposure (MOE) would equal the benchmark MOE for acute occupational exposures using the following equation:

$$EV_{acute} = \frac{HEC_{acute}}{Benchmark\ MOE_{acute}} \times \frac{AT_{HEC\ acute}}{ED} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{2.42\ ppm}{30} \times \frac{\frac{24h}{d}}{\frac{8h}{d}} \times \frac{0.6125\frac{m^3}{h}}{1.25\frac{m^3}{h}} = \mathbf{0.12\ ppm}$$

$$EV_{acute}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.12\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{0.48\ mg/m^3}$$

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 exposure using the following equation:

$$EV_{intermediate} = \frac{HEC_{intermediate}}{Benchmark\ MOE_{intermediate}} \times \frac{AT_{HEC\ intermediate}}{ED \times EF} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{5.2\ ppm}{30} \times \frac{\frac{24h}{d} \times 30d}{\frac{8h}{d} \times 22d} \times \frac{0.6125\frac{m^3}{h}}{1.25\frac{m^3}{h}} = \mathbf{0.35\ ppm}$$

$$EV_{intermediate}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm\ \times\ MW}{Molar\ Volume} = \frac{0.35\ ppm\ \times\ 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{1.4\ mg/m^3}$$

Chronic Non-Cancer Occupational 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 8-hour chronic occupational exposures with the following equation:

$$EV_{chronic} = \frac{HEC_{chronic}}{Benchmark\ MOE_{chronic}} \times \frac{AT_{HEC\ chronic}}{ED \times EF\ \times WY} \times \frac{IR_{resting}}{IR_{workers}}$$

$$= \frac{5.2\ ppm}{300} \times \frac{\frac{24h}{d} \times \frac{365d}{y} \times\ 40\ y}{\frac{8h}{d} \times \frac{250d}{y} \times 40\ y} \times \frac{0.6125\frac{m^3}{h}}{1.25\frac{m^3}{h}} = \mathbf{0.037\ ppm}$$

$$EV_{chronic}\left(\frac{mg}{m^3}\right) = \frac{EV\ ppm \times MW}{Molar\ Volume} = \frac{0.037\ ppm \times 98.96\ \frac{g}{mol}}{24.45\ \frac{L}{mol}} = \mathbf{0.15\ mg/m^3}$$

The parameters used in the above equations are summarize below. Numerical values chosen for the parameters are described in relevant sections of this draft risk evaluation and the *Draft Human Health Hazard Assessment for 1,2-Dichloroethane* (U.S. EPA, 2024b).

Where:

$AT_{HECchronic}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, chronic occupational risk, based on study conditions and/or HEC adjustments (24 hours/day for 365 days/year) and assuming the number of years matches the high-end working years (WY, 40 years) for a worker
$AT_{HECintermediate}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, intermediate occupational risk, based on study conditions and/or any HEC adjustments (24 hours/day for 30 days)
$AT_{HECacute}$	=	Averaging time for the POD/HEC used for evaluating non-cancer, acute occupational risk, based on study conditions and/or any HEC adjustments (24 hours/day)
AT_{IUR}	=	Averaging time for the cancer IUR, based on study conditions and any adjustments (24 hours/day for 365 days/year) and averaged over a lifetime (78 years)
$Benchmark\ MOE_{chronic}$	=	Chronic non-cancer benchmark margin of exposure, based on the total uncertainty factor of 300
$Benchmark\ MOE_{intermediate}$	=	Intermediate non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
$Benchmark\ MOE_{acute}$	=	Acute non-cancer benchmark margin of exposure, based on the total uncertainty factor of 30
$Benchmark_{cancer}$	=	Benchmark for excess lifetime cancer risk
EV_{acute}	=	Draft occupational exposure value based on degeneration with necrosis of the olfactory mucosa
$EV_{intermediate}$	=	Draft occupational exposure value based on decrease in sperm concentration
$EV_{chronic}$	=	Draft occupational exposure value based on decrease in sperm concentration
EV_{cancer}	=	Draft occupational exposure value based on excess cancer risk
ED	=	Exposure duration (8 hours/day)
EF	=	Exposure frequency (1 day/year for acute, 22 days/year for intermediate, 250 days/year for chronic and lifetime)
$HEC_{acute,\ intermediate,\ or\ chronic}$	=	Human equivalent concentration for acute, intermediate, or chronic OESs
IUR	=	Inhalation unit risk (per mg/m^3 and per ppm)
IR	=	Inhalation rate (default is 1.25 m^3/h for workers and 0.6125 m^3/h for the general population at rest; 0.6125 m^3/h is also assumed for animals in toxicity studies if they are 'at rest' vs. exercising)
WY	=	Working years per lifetime at the 95th percentile (40 years)
Molar volume	=	24.45 L/mol, the volume of a mole of gas at 1 atm and 25 °C
MW	=	Molecular weight of 1,2-dichloroethane (98.96 g/mole)

Unit conversion:

1 ppm = 4.05 mg/m^3 (based on the molecular weight of 98.96 g/mol for 1,2-dichloroethane)

F.2 Summary of Air Sampling Analytical Methods Identified

EPA conducted a search to identify relevant NIOSH, OSHA, and EPA analytical methods used to monitor for the presence of 1,2-dichloroethane in air (see Table Apx F-1). This table presents validated methods from governmental agencies and is not intended to be a comprehensive list of available air monitoring methods for 1,2-dichloroethane. The sources used for the search included the following:

1) NIOSH Manual of Analytical Methods (NMAM); 5th Edition
2) NIOSH NMAM; 4th Edition (accessed November 12, 2025)
3) OSHA Index of Sampling and Analytical Methods (accessed November 12, 2025)
4) EPA Environmental Test Method and Monitoring Information (accessed November 12, 2025)

Table Apx F-1. Limit of Detection (LOD) and Limit of Quantification (LOQ) Summary for Air Sampling Analytical Methods Identified for 1,2-Dicchloroethane

Air Sampling Analytical Methods	Year Published	LOD[a] (ppm)	LOQ (ppm)	Notes	Source
NIOSH Method 1003	2003	5.8E−02	0.19	The working range is 16–1,320 ppm at 50 L.	NIOSH NMAM, 4th Edition
OSHA Method 03	1979	1.6E−04	N/A	The lower limit of the estimated working range, assuming adequate desorption efficiency, is 0.05 ppm. The upper limit of the working range is dependent on the capacity of the collection medium.	OSHA Index of Sampling and Analytical Methods

ppm = parts per million; ppb = parts per billion; ppt = parts per trillion
[a] These sources cover a range of LOD including both below and above the ECEL value.
Note: all URLs in table last accessed November 11, 2025.

Additionally, the working range of NIOSH 1003 for 1,2-dichloroethane is 16 to 1,320 parts per million (ppm) (16,000–1,320,000 ppb), which is significantly higher than EPA's provisional occupational exposure limit (pOEL) for 1,2-dichloroethane of 5 ppb (0.005 ppm). To allow for a comparison to this value, a validated method of sample analysis was developed and identified as NIOSH 1003 modified. For the modified NIOSH 1003 method, the LOD is 4×10^{-4} ppm (0.40 ppb) and the LOQ is 1.4×10^{-4} ppm (0.14 ppb). The laboratory method validation report is included in Appendix K of the Test Order Inhalation Monitoring Data Package for 1,1-Dichloroethane (EPA-HQ-OPPT-2024-0114-0040) and further details are provided in Appendix I of this document.

F.3 Short-Term Occupational Exposure Value Derivation

According to *Current Intelligence Bulletin 69: NIOSH Practices in Occupational Risk Assessment* (NIOSH, 2020), a short-term occupational exposure value (described as a short-term exposure limit [STEL] in (NIOSH, 2020)) should be derived if there is a concern for effects following short-term exposure at 15-minute concentrations. The 8-hour TWA most sensitive occupational exposure value would prevent 15-minute exposures above 32× that value (based on 32 15-minute periods in 8 hours), assuming only a single 15-minute chemical exposure in 1 day. Therefore, if short-term health effects are expected and can be quantified with a derived short-term occupational exposure value (STEV) lower than 32×, the most sensitive exposure value (EV), implementing a short-term exposure value could be justified.

EPA derived an acute exposure value (EV_{acute}) of 2.42 ppm for 1,2-dichlororoethane based on degeneration with necrosis of the olfactory mucosa resulting from acute exposure (Dow Chemical, 2006) with an uncertainty factor (UF) of 30. According to principles of (ten Berge et al., 1986), Haber's Law is adjusted by the use of an exponent to create a more shallow slope, resulting in a more health-protective value when extrapolating to shorter durations. Due to lack of a published chemical-specific exponent value in (ten Berge et al., 1986) or other study for 1,2-dichloroethane, use of the default exponent of 3, as per NIOSH IDLH guidance (NRC, 2001) and the Standard Operating Procedure for AEGLs (NIOSH, 2013), and a benchmark MOE of 30, the 15-minute HEC is 7.7 ppm and the STEV is 0.26 ppm (see calculations below).

The most sensitive occupational exposure value for 1,2-dichloroethane is 0.014 ppm based on lifetime cancer IUR, based on an 8-hour TWA assuming a typical 40-hour work week. Because the calculated short-term exposure value (0.26 ppm) is lower than the 15-minute TWA occupational exposure equivalent value (*i.e.,* 0.46 ppm), this short-term exposure value is more sensitive for short-term exposures.

Table_Apx F-2. Comparison Between Occupational Exposure Values for 1,2-Dichloroethane

Value Type	Most Sensitive Occupational Exposure Value (8-hour TWA)	Most Sensitive Occupational Exposure Value (15-minute TWA)	Possible Short-Term Occupational Exposure Value (15-minute value)
Health Effect	Cancer	Cancer	Respiratory (olfactory)
Exposure Value (ppm)	0.014	0.46	0.26

Below are the calculations used to derive the short-term occupational exposure value. EPA used study data from (Dow Chemical, 2006), which is also the basis of the EV_{acute}.

The initial step in adjusting an acute HEC for a shorter duration is to derive the ten Berge constant (k) based on the POD and exposure duration from the study along with the ten Berge exponent (n) for 1,2-dichloroethane as follows:

$$k = C^n \times t$$
$$k = 2.42^3 \times 8$$
$$k = 113.4$$

Where:

C	=	Air concentration / study POD at duration *t* in ppm (2.42 ppm; calculated HEC from (Dow Chemical, 2006))
n	=	ten Berge exponent (3; default based on (NRC, 2001) and (NIOSH, 2013))
t	=	Timepoint of the measured concentration, in hours (8 hours in (Dow Chemical, 2006))
k	=	Calculated ten Berge constant

The new HEC is then calculated using the same equation, where k and n remain constant:

$$C^n \times t = k$$
$$\mathrm{C}^3 \times 0.25 = 113.4$$

$$C = \left(\frac{113.4}{0.25}\right)^{\frac{1}{3}}$$
$$C_{STEV} = 7.7\ ppm$$

Where:

C_{STEV}	=	HEC at short-term exposure value duration *t* in ppm
t	=	Relevant exposure duration for a short-term exposure value (15 minutes, or 0.25 hours)

Finally, the short-term exposure value is calculated from the C_{STEV} by applying the benchmark MOE used for non-cancer acute risk estimates and the EV_{acute} derivation, as follows:

$$STEV = C_{STEV}/Benchmark\ MOE$$
$$STEV = 7.7/30$$
$$STEV = 0.26\ ppm$$

Where:

STEV	=	Short-term exposure value
Benchmark MOE	=	Acute non-cancer benchmark margin of exposure, based on the Total uncertainty factor of 30

Appendix G ACUTE GENERAL POPULATION NON-CANCER AMBIENT AIR INHALATION RISK TABLES

Table_Apx G-1. General Population Acute Inhalation Risk Summary Table at 100–2,500 m from TRI-Reported Facility Releases from 2015–2020 Based on Ambient Air Concentrations Estimated Using AERMOD[a b c d]

COU			OES	Facility Count	Facility Count Above Benchmark (30) at Distances Shown in Table [e]	Exposure Conc. Statistic (Percentile)	Maximum Acute Risk (Benchmark = 30) [f]			Overall Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	24	0	10th	8.30E05	1.13E06	3.07E06	Robust
					0	50th	6.66E04	1.63E05	5.66E05	
					0	95th	1.68E02	4.75E02	1.96E03	
Manufacturing /Processing	Import/ Repackaging	Repackaging	Repackaging	5	0	10th	5.38E07	7.71E07	2.07E08	Robust
					0	50th	7.59E06	1.66E07	4.47E07	
					0	95th	3.50E04	9.79E04	4.22E05	
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/*e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant	12	0	10th	2.47E07	3.49E07	9.87E07	Robust
					0	50th	1.35E06	3.52E06	1.42E07	
					0	95th	2.02E04	5.38E04	1.92E05	
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/ Other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/ adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/process solvent	Processing into formulation, mixture, or reaction product	12	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	2.61E06	5.16E06	1.66E07	
					0	95th	1.39E03	3.71E03	1.65E04	

COU			OES	Facility Count	Facility Count Above Benchmark (30) at Distances Shown in Table [e]	Exposure Conc. Statistic (Percentile)	Maximum Acute Risk (Benchmark = 30) [f]			Overall Confidence [g]
Life Cycle Stage	**Category**	**Subcategory**					**100–1,000 m**	**1,000 m**	**2,500 m**	
Industrial Use	Solvents (for cleaning and degreasing	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	1	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	3.57E08	6.36E08	2.14E09	
					0	95th	1.42E06	3.19E06	1.13E07	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (incinerator)	19	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	1.78E07	3.25E07	1.05E08	
					0	95th	3.32E04	8.03E04	3.57E05	

[a] Acute risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb).
[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by their OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk from within OES.
[d] This table shows for all OESs that are represented by TRI-reported releases regardless of how the risk compares to the benchmark.
[e] This column shows the number of facilities where the risk exceeds benchmark for the distances shown in this table.
[f] **The #DIV/0! error occurred for scenarios where the concentrations estimated by AERMOD were outputted as a 0**.
[g] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

Table_Apx G-2. General Population Acute Inhalation Risk Summary Table at 100–2,500 m from NEI-Reported Facility Releases from 2014 and 2017 Based on Modeled Ambient Air Concentrations Estimated Using AERMOD [a b c d]

COU			OES	Release Count [e]	Release Count Above Benchmark (30) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Acute Risk (Benchmark = 30) [g]			Confidence [h]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Manufacturing	Manufacturing	439	0	10th	6.80E05	1.69E06	7.26E06	Robust
					0	50th	1.51E04	4.05E04	8.99E05	
					0	95th	195	483	2.20E03	
Import/ Repackaging	Import/repackaging	Repackaging	Repackaging	1,093	0	10th	4.62E06	8.23E06	3.52E07	Robust
					0	50th	5.94E05	1.19E06	4.83E06	
					0	95th	7.10E03	3.00E04	1.33E05	
Processing/ Industrial Use	Processing – as a reactant/ recycling/process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/*e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant	127	0	10th	2.37E06	4.51E06	1.93E07	Robust
					0	50th	1.83E05	3.55E05	1.39E06	
					0	95th	1,709	5,533	2.15E04	
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/ other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/processing aids: specific to petroleum production/adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; Pesticide, fertilizer, and other agricultural chemical manufacturing/Process solvent	Processing into formulation, mixture, or reaction product	76	0	10th	3.87E06	5.73E06	2.63E07	Robust
					0	50th	9.95E05	2.54E06	8.44E06	
					0	95th	1,029	2,683	1.18E04	
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	419	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	3.44E06	7.90E06	3.65E07	
					0	95th	1.79E04	4.20E04	1.80E05	
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	6	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	7.65E10	2.64E11	1.12E12	
					0	95th	4.05E08	1.20E09	5.32E09	

COU			OES	Release Count [e]	Release Count Above Benchmark (30) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Acute Risk (Benchmark = 30) [g]			Confidence [h]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Industrial use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	53	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	2.51E06	4.35E06	1.70E07	
					0	95th	5.76E04	1.24E05	3.83E05	
Commercial Use	Other use	Laboratory chemical	Laboratory use	9	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	4.20E06	8.75E06	3.98E07	
					0	95th	5.44E04	1.32E05	5.87E05	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (incinerator)	103	0	10th	1.13E07	2.21E07	1.04E08	Robust
					0	50th	1.22E06	2.81E06	1.33E07	
					0	95th	4.97E04	1.41E05	6.24E05	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)	147	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	1.60E07	3.04E07	1.23E08	
					0	95th	1.35E05	3.63E05	1.34E06	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (non-POTW WWT)	68	0	10th	1.40E07	2.56E07	1.18E08	Robust
					0	50th	1.42E06	3.29E06	1.59E07	
					0	95th	5.53E04	1.41E05	6.01E05	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (POTW)	69	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	8.99E06	1.83E07	8.99E07	
					0	95th	3.24E04	8.82E04	3.67E05	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (remediation)	45	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Robust
					0	50th	2.03E06	2.75E06	7.05E06	
					0	95th	2.63E04	3.33E04	7.36E04	

COU			OES	Release Count [e]	Release Count Above Benchmark (30) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Acute Risk (Benchmark = 30) [g]			Confidence [h]
Life Cycle Stage	**Category**	**Subcategory**					**100–1,000 m**	**1,000 m**	**2,500 m**	
N/A	N/A	N/A	Facilities not mapped to an OES	115	0	10th	#DIV/0!	#DIV/0!	#DIV/0!	Moderate
					0	50th	1.43E07	2.32E07	5.83E07	
					0	95th	6.80E04	1.76E05	7.59E05	

POTW = Publicly owned treatment works; WWT = Wastewater treatment
[a] Acute risks are based on a continuous inhalation exposure at a single modeled distance.
[b] Acute inhalation risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).
[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk from within OES.
[d] This table shows for all OESs that are represented by NEI-reported releases regardless of how the risk compares to the benchmark.
[e] This column shows the total number of releases (based on unique emission unit ID) associated with each OES.
[f] This column shows the total number of releases (based on unique emission unit ID) associated with each OES.
[g] **The #DIV/0! error occurred for scenarios where the concentrations estimated by AERMOD were outputted as a 0.**
[h] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

Table_Apx G-3. Maximum 95th Percentile Acute Inhalation Risks Estimated Within 100–2,500 m of Generic Facilities/Sites for OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Estimated Using AERMOD[a b c]

OES [d]	Meteorology [e]	Land Use	Maximum Acute Risk (Benchmark = 30)			Overall Confidence [f]
			100–1,000 m	1,000 m	2,500 m	
Industrial application of adhesives and sealants	Lake Charles, LA	Rural	31	71	307	Slight
	Lake Charles, LA	Urban	105	268	1.24E03	
Commercial aerosol products	Lake Charles, LA	Rural	8.59E04	3.25E05	2.15E06	Slight
	Lake Charles, LA	Urban	9.42E04	3.15E05	2.01E06	
Non-aerosol cleaning and degreasing	Lake Charles, LA	Rural	1.46E03	5.14E03	3.25E04	Slight
	Lake Charles, LA	Urban	1.60E03	5.78E03	3.42E04	
Laboratory Use	Lake Charles, LA	Rural	5.77E06	1.66E07	1.05E08	Moderate
	Lake Charles, LA	Urban	5.59E06	1.54E07	9.92E07	

[a] See *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for discussion of EPA modeled releases for generic facilities/sites.
[b] Acute risks are based on a continuous inhalation exposure at a single modeled distance.
[c] Acute inhalation risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[d] See Table 3-3 for mapping of the OES to COU mapping for the OESs of Industrial application of adhesives and sealants; Non-aerosol cleaning and degreasing; and Laboratory use. For the OES of Commercial aerosol products, the life cycle stage is Industrial use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.
[e] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[f] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

Appendix H CHRONIC GENERAL POPULATION NON-CANCER AMBIENT AIR INHALATION RISK TABLES

Table_Apx H-1. General Population Chronic Non-Cancer Inhalation Risk Summary Table at 100–2,500 m from TRI-Reported Facility Releases from 2015–2020 Based on Modeled Ambient Air Concentrations for 1,2-Dichloroethane Estimated Using AERMOD[a b c d]

COU			OES	Facility Count	Facility Count Below Benchmark (300) at Distances Shown in Table [e]	Exposure Conc. Statistic (Percentile)	Maximum Chronic Risk (Benchmark = 300)			Overall Confidence [f]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Domestic manufacture	Manufacturing	24	0	10th	6.17E03	8.77E03	3.99E04	Robust
					0	50th	2.86E03	6.00E03	2.72E04	
					0	95th	5.38E02	3.29E03	1.45E04	
Manufacturing/ Processing	Import/ repackaging	Repackaging	Repackaging	5	0	10th	2.78E06	4.07E06	1.91E07	Robust
					0	50th	8.29E05	1.80E06	7.44E06	
					0	95th	9.74E04	4.00E05	1.88E06	
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/*e.g.* catalyst moderator; oxidation inhibitor	Processing as a reactant	12	0	10th	6.48E05	1.04E06	3.85E06	Robust
					0	50th	3.18E05	5.55E05	2.06E06	
					0	95th	6.32E04	3.17E05	1.23E06	
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/ other use	Fuels and fuel additives: All other petroleum and coal products manufacturing/processing aids: specific to petroleum production/adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/ process solvent	Processing into formulation, mixture, or reaction product	12	0	10th	5.54E04	7.28E04	3.43E05	Robust
					0	50th	2.68E04	4.95E04	2.28E05	
					0	95th	4.64E03	3.46E04	1.58E05	
Industrial Use	Solvents (for cleaning and degreasing	Degreasing and cleaning solvents	Non-aerosol cleaning and degreasing	1	0	10th	4.95E07	6.62E07	2.62E08	Robust
					0	50th	2.29E07	3.74E07	1.42E08	
					0	95th	5.64E06	2.51E07	9.48E07	

COU			OES	Facility Count	Facility Count Below Benchmark (300) at Distances Shown in Table [e]	Exposure Conc. Statistic (Percentile)	Maximum Chronic Risk (Benchmark = 300)			Overall Confidence [f]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (Incinerator)	19	0	10th	1.25E06	1.61E06	7.74E06	Robust
					0	50th	6.52E05	1.28E06	5.88E06	
					0	95th	1.18E05	5.05E05	1.91E06	

COU = condition of use; OES = occupational exposure scenario
[a] Chronic non-cancer risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD TRI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025bb).
[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by their OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk from within OES.
[d] This table shows for all OESs that are represented by TRI-reported releases regardless of how the risk compares to the benchmark.
[e] This column shows the number of facilities where the risk exceeds benchmark for the distances shown in this table.
[f] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

Table_Apx H-2. General Population Chronic Non-Cancer Inhalation Risk Summary Table at 100–2,500 m from Reported NEI Facility Releases from 2014 and 2017 Based on Modeled Ambient Air Concentrations Estimated Using AERMOD[a b c d]

COU			OES	Release Count [e]	Release Count Above Benchmark (300) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Chronic Non-Cancer Risk (Benchmark = 300)			Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Manufacturing	Domestic manufacture	Manufacturing	Manufacturing	439	0	10th	8,221	1.25E04	5.98E04	Robust
					0	50th	3,805	7,709	3.71E04	
					0	95th	663	4,575	2.08E04	
Import/ Repackaging	Import/ repackaging	Repackaging	Repackaging	1,093	0	10th	3.52E05	4.96E05	3.22E06	Robust
					0	50th	1.57E05	3.96E05	1.81E06	
					0	95th	2.41E04	1.93E05	9.48E05	
Processing/ Industrial Use	Processing – as a reactant/ recycling/ process regulator	Intermediate in: Petrochemical manufacturing; plastic material and resin manufacturing; all other basic organic chemical manufacturing/recycling/ *e.g.*, catalyst moderator; oxidation inhibitor	Processing as a reactant	127	0	10th	9.23E04	1.45E05	6.70E05	Robust
					0	50th	3.40E04	6.99E04	3.19E05	
					0	95th	5,612	3.74E04	1.81E05	
Processing/ Industrial Use	Processing – incorporated into formulation, mixture, or reaction product/ other use	Fuels and fuel additives: all other petroleum and coal products manufacturing/ processing aids: specific to petroleum production/ adhesives and sealants; lubricants and greases; process regulators; degreasing and cleaning solvents; pesticide, fertilizer, and other agricultural chemical manufacturing/ process solvent	Processing into formulation, mixture, or reaction product	76	0	10th	8.35E04	1.13E05	5.33E05	Robust
					0	50th	2.57E04	7.31E04	3.38E05	
					0	95th	3,346	1.36E04	6.42E04	
Industrial Use	Adhesives and sealants	Adhesives and sealants	Industrial application of adhesives and sealants	419	0	10th	7.52E05	9.79E05	4.46E06	Robust
					0	50th	3.43E05	7.09E05	3.22E06	
					0	95th	6.12E04	3.85E05	1.75E06	

COU			OES	Release Count [e]	Release Count Above Benchmark (300) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Chronic Non-Cancer Risk (Benchmark = 300)			Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Industrial Use	Lubricants and greases	Solid film lubricants and greases	Industrial application of lubricants and greases	6	0	10th	2.27E10	3.53E10	1.78E11	Robust
					0	50th	8.13E09	1.53E10	7.33E10	
					0	95th	1.12E09	5.25E09	2.51E10	
Industrial Use	Solvents (for cleaning and degreasing)	Degreasing and cleaning solvents	Non–aerosol cleaning and degreasing	53	0	10th	1.99E06	2.84E06	9.65E06	Robust
					0	50th	1.09E06	1.55E06	5.12E06	
					0	95th	2.02E05	8.00E05	2.81E06	
Commercial Use	Other use	Laboratory chemical	Laboratory use	9	0	10th	2.43E06	3.67E06	1.68E07	Robust
					0	50th	9.88E05	2.04E06	9.27E06	
					0	95th	1.95E05	8.52E05	3.83E06	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (incinerator)	103	0	10th	1.93E06	2.87E06	1.29E07	Robust
					0	50th	8.06E05	1.59E06	7.33E06	
					0	95th	1.49E05	9.35E05	4.56E06	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (landfill)	147	0	10th	4.55E06	6.81E06	3.15E07	Robust
					0	50th	2.31E06	4.23E06	1.95E07	
					0	95th	3.99E05	2.06E06	8.06E06	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (non-POTW WWT)	68	0	10th	1.93E06	2.51E06	1.16E07	Robust
					0	50th	9.11E05	1.93E06	8.92E06	
					0	95th	1.75E05	9.79E05	4.21E06	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (POTW)	69	0	10th	1.22E06	1.56E06	7.13E06	Robust
					0	50th	5.73E05	1.25E06	5.66E06	
					0	95th	1.09E05	5.67E05	2.56E06	

COU			OES	Release Count [e]	Release Count Above Benchmark (300) at Distances Shown in Table [f]	Exposure Conc. Statistic (Percentile)	Maximum Chronic Non-Cancer Risk (Benchmark = 300)			Confidence [g]
Life Cycle Stage	Category	Subcategory					100–1,000 m	1,000 m	2,500 m	
Disposal	Disposal	Disposal	Waste handling, treatment, and disposal (remediation)	45	0	10th	5.42E05	6.10E05	1.49E06	Robust
					0	50th	3.85E05	4.70E05	9.88E05	
					0	95th	1.56E05	2.22E05	6.12E05	
N/A	N/A	N/A	Facilities not mapped to an OES	115	0	10th	2.60E06	3.91E06	1.81E07	Moderate
					0	50th	1.28E06	2.35E06	1.08E07	
					0	95th	2.47E05	1.44E06	5.66E06	

COU = condition of use; OES = occupational exposure scenario; POTW = publicly owned treatment works; WWT = wastewater treatment
[a] Chronic non-cancer risks are based on a continuous inhalation exposure at a single modeled distance.
[b] Chronic non-cancer inhalation risks were calculated at additional distances from 10-10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD NEI Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025ba).
[c] 10th, 50th, and 95th percentile risks were calculated for each modeled facility and categorized by OES. The risks in this table were calculated using the maximum 10th, 50th, and 95th percentile cancer risk from within the OES.
[d] This table shows for all OESs that are represented by NEI-reported releases regardless of how the risk compares to the benchmark.
[e] This column shows the total number of releases (based on unique emission unit ID) associated with each OES.
[f] This column shows the number of releases (based on unique emission unit ID) where the risk exceeds benchmark for the distances shown in this table.
[g] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

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6199 **Table_Apx H-3. Maximum 95th Percentile Chronic Non-Cancer Risks Estimated within 100–2,500 m of Generic Facilities/Sites for**
6200 **OESs with EPA-Estimated Releases Based on Modeled Ambient Air Concentrations Estimated Using AERMOD[a b c]**

OES	Meteorology [a]	Land Use	Maximum Chronic Non-Cancer Risk (Benchmark = 300)			Overall Confidence
			100–1,000 m	1,000 m	2,500 m	
Industrial application of adhesives and sealants	Lake Charles, LA	Rural	128	5.79E02	2.33E03	Slight
	Lake Charles, LA	Urban	3.76E02	2.47E03	1.13E04	
Commercial aerosol products	Lake Charles, LA	Rural	1.85E05	9.23E05	4.38E06	Slight
	Lake Charles, LA	Urban	2.87E05	1.74E06	9.27E06	
Non-aerosol cleaning and degreasing	Lake Charles, LA	Rural	3.92E03	4.39E04	2.68E05	Slight
	Lake Charles, LA	Urban	4.08E03	4.62E04	3.21E05	
Laboratory use	Lake Charles, LA	Rural	1.34E07	1.27E08	7.34E08	Moderate
	Lake Charles, LA	Urban	1.35E07	1.34E08	8.10E08	

[a] See *Draft Environmental Release Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025ag) for discussion of EPA modeled releases for generic facilities/sites.
[b] Chronic non-cancer risks are based on a continuous inhalation exposure at a single modeled distance.
[c] Chronic non-cancer risks were calculated at additional distances from 10–10,000 m from all facilities and can be found in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[d] See Table 3-3 for mapping of the OES to COU mapping for the OESs of Industrial application of adhesives and sealants; Non-aerosol cleaning and degreasing; and Laboratory use. For the OES of Commercial aerosol products, the life cycle stage is Industrial Use, the category is Solvents (for cleaning and degreasing), and the subcategory is Degreasing and cleaning solvents.
[e] For OESs with estimated releases from generic facilities/sites, EPA assumed meteorology stations for modeling of ambient air concentrations. EPA is presenting results when using the Lake Charles, LA, station in this table. Previous work has shown that the Lake Charles, LA, station tends to produce higher air concentrations relative to other meteorology stations available in AERMOD. EPA also modeled estimated releases from generic facilities/sites using the Sioux Falls, SD, meteorology station, which tends to produce central-tendency air concentrations relative to other stations. The results using the Sioux Falls, SD, station are presented in *Draft Supplemental Information on AERMOD Generic Releases Exposure and Risk Analysis for 1,2-Dichloroethane* (U.S. EPA, 2025az).
[f] Rationale for the overall confidences can be found in *Draft General Population Exposure Assessment for 1,2-Dichloroethane* (U.S. EPA, 2025aj).

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Appendix I SUMMARY OF 1,2-DICHLOROETHANE AIR SAMPLING FROM TEST ORDER

In response to a test order, the Vinyl Institute's Consortium submitted a Draft Final Study Plan (DFSP) that was then reviewed by EPA. After addressing the Agency's comments, the Consortium submitted a revised DFSP that was subsequently approved by EPA in February 2023. The approved DFSP included the use of a modified NIOSH 1003 method capable of detecting below EPA's Occupational Exposure Values. The analytical method recommended in the Test Order, NIOSH 1003, utilizes a gas chromatography (GC), flame ionizer detector (FID) technique for analysis of samples. The working range of NIOSH 1003 for 1,2-dichloroethane is 16 to 1,320 parts per million (ppm) (16,000–1,320,000 ppb), which is significantly higher than EPA's provisional occupational exposure limit (pOEL) for 1,2-dichloroethane of 5 ppb (0.005 ppm). To allow for a comparison to this value, a validated method of sample analysis using a more sensitive analytical technique, gas chromatography with mass spectroscopy (GC/MS) was developed. The laboratory method validation report is included in Appendix K of the *Test Order Inhalation Monitoring Data Package for 1,1-Dichloroethane* (EPA-HQ-OPPT-2024-0114-0040). The sampling methodology that was used were the Assay Technology 525 TraceAir® II (AT525) activated charcoal passive badges and validation was performed to confirm that this media would result in similar performance as compared to the sorbent tube method recommended in NIOSH 1003.

The 1,2-dichloroethane inhalation monitoring was conducted from May 16 through November 28, 2023. A total of 268 full-shift samples and 124 task length samples across SEGs were collected at 9 facilities from 9 different companies of the Vinyl Institute's Consortium. At the 5 facilities that intentionally manufacture 1,2-dichloroethane, 162 full-shift samples, 77 task length samples, and 109 STEL samples were collected. At the 2 facilities that manufacture 1,2-dichloroethane as a byproduct, 53 full-shift samples, 21 task length samples, and 46 STEL samples were collected. At the 2 facilities that process 1,2-dichloroethane as a reactant, 53 full-shift samples, 26 task length samples, and 50 STEL samples were collected.

In February 2024, the Consortium submitted a final study report with the data requested by the Test Order that was reviewed and accepted by EPA. Of the 268 full-shift samples, 14 were non-detect for a percent non-detect of 5.22 percent. Validation results showed acceptable media and GC/MS method performance for 1,2-dichloroethane over the concentration range evaluated. The limit of quantification (LOQ) for the modified NIOSH 1003 method is below EPA's proposed Occupational Exposure Value (see Table_Apx I-1) and was well below the original NIOSH 1003 method as presented previously in Table Apx F-1.

Table_Apx I-1. Overview and Comparison of OEV, LOD, and LOQ Parameters of NIOSH 1003 Modified

Parameter	Value	Unit
Occupational exposure value (OEV)	1.4E−02	ppm (or 0.058 mg/m^3)
Limit of detection (LOD)	4.8	ng/sample
	1.6	µg/m^3
	1.6E−03	mg/m^3
	0.40	ppb
	4.0E−04	ppm
Limit of quantification (LOQ)	17	ng/sample
	0.56	µg/m^3
	5.6E−04	mg/m^3
	0.14	ppb
	1.4E−04	ppm

Appendix J ADDITIONAL SOURCES OF INFORMATION ON PPE

The European Centre for Ecotoxicology and Toxicology of Chemicals Targeted Risk Assessment (ECETOC TRA) Model represents the protection factor of gloves as a fixed, assigned protection factor (PF) equal to 5, 10, or 20 (Marquart et al., 2017). It should be noted that the described PFs are not based on experimental values or field investigations of PPE effectiveness, but rather professional judgements used in the development of the ECETOC TRA Model. These protection factors are summarized below Table_Apx J-1.

Table_Apx J-1. Glove Protection Factors for Different Dermal Protection Strategies from ECETOC TRA v3

Dermal Protection Characteristics	Setting(s)	Protection Factor (PF)
a. No gloves used, or any glove / gauntlet without permeation data and without employee training	Industrial and Commercial Uses	1
b. Gloves with available permeation data indicating that the material of construction offers good protection for the substance		5
c. Chemically resistant gloves (*i.e.*, as b above) with "basic" employee training		10
d. Chemically resistant gloves in combination with specific activity training (*e.g.*, procedure for glove removal and disposal) for tasks where dermal exposure can be expected to occur	Industrial Uses Only	20