United States
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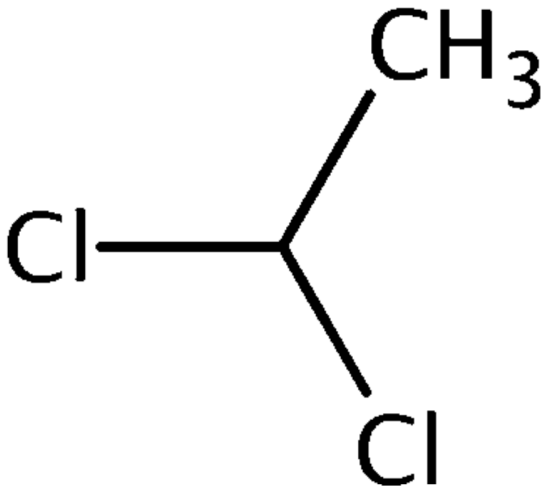
Office of Chemical Safety and
Pollution Prevention

Draft Risk Evaluation for 1,1-Dichloroethane

Systematic Review Supplemental File:

Data Quality Evaluation and Data Extraction Information for Environmental Release and Occupational Exposure

CASRN: 75-34-3



July 2024

This supplemental file contains information regarding the data extraction and quality evaluation results for data sources that were considered for the *Draft Risk Evaluation for 1,1-Dichloroethane* and that underwent systematic review. EPA conducted data extraction, and quality evaluation based on author-reported descriptions and results; additional analyses (*e.g.*, statistical analyses) potentially conducted by EPA are not contained in this supplemental file. EPA used the TSCA systematic review process described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances* (also referred to as the '2021 Draft Systematic Review Protocol').

Data that met the RESO screening criteria during the full-text screening was extracted by three data types, general facility, occupational exposure, and environmental release, as explained in Section 6.2 of the 2021 Draft Systematic Review Protocol. Five different data quality evaluation forms were used depending on the data type and condition of use (COU), as explained in Appendix M of the 2021 Draft Systematic Review Protocol. All references with data points containing monitoring data (*e.g.*, measured occupational exposures) underwent data quality evaluation as described in Section M.6.1, using the monitoring data quality metrics. All references with data points containing environmental release data (*e.g.*, measured or calculated quantities of chemical release across facility fence line) underwent data quality evaluation as described in Section M.6.2, using the environmental release data quality metrics. All references with data points containing published models for environmental release or occupational exposure (*e.g.*, published models used to calculate occupational exposure or environmental releases) underwent data quality evaluation as described in Section M.6.3, using the published models for environmental release or occupational exposure quality metrics. All references with data points containing completed exposure or risk assessments (*e.g.*, completed exposure or risk assessments containing a broad range of data types) underwent data quality evaluation as described in Section M.6.4, using the completed exposure or risk assessments quality metrics. All references with data points containing reports for data or information other than exposure or release data (*e.g.*, process description) underwent data quality evaluation as described in Section M.6.5, using the reports for data or information other than exposure or release data quality metrics. The extracted data and their data quality evaluation are available in the tables below.

Additionally, each data type and condition of use is evaluated independently within a given study; therefore, each reference may have more than one overall quality determination (OQD) to reflect the quality of each outcome and the exposures and releases more appropriately as described by the study authors. No OQD is determined for each reference, as a whole, if it contains data from more than one evidence stream. Within the contents of this document, 1,1-dichloroethane may be referred to as the acronyms 1,1-DCA and 1,1-DCE. The acronyms 1,2-DCA, 1,2-DCE, and DCE refer to the chemical 1,2-dichloroethane. The acronyms 1,1,2-TCE, 1,1,2-TCA, and TCE refer to the chemical 1,1,2-trichloroethane. The acronym trans-1,2-DCE refers to the chemical trans-1,2-dichloroethylene. The acronym 1,2-DCP refers to the chemical 1,2-dichloropropane.

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35002	U.S. EPA (2001). Sources, emission and exposure for trichloroethylene (TCE) and related chemicals. GRA and I:138.	**54**
10180484	U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.	**55**
11181053	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.	**56**
46492	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.	**57**
6535959	U.S. EPA, (2019). National Emissions Inventory (NEI) [database]: CASRNs 79-00-5, 75-34-3, 107-06-2, 78-87-5, 84-61-7, 106-99-0, 106-93-4, 50-00-0, 85-44-9, 106-46-7, 85-68-7, 84-74-2, and 115-86-6.	**58**
7310515	U.S. EPA, (1995). Chapter 4.10 commercial/consumer solvent use. AP-42: Compilation of air pollutant emission factors volume I: Stationary point and area sources.	**59**
8347325	U.S. EPA, (2021). National Analysis TRI dataset (TRI): Data used for TSCA Risk Evaluations, reporting year 2019.	**60**
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11182965	VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.	**62**
78369	Walker, B.L., Cooper, C.D. (1992). Air pollution emission factors for medical waste incinerators. Journal of the Air and Waste Management Association 42(6):784-791.	**63**
5740947	Whittaker, K. F., Moore, A. T. (1984). Pilot scale investigations in the removal of volatile organics and phthalates from electronics manufacturing wastewater. :579-589.	**64**

Completed Exposure or Risk Assessments

3827300	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.	**65**
6306753	OECD, (2011). Emission scenario document on the chemical industry.	**66**
6393282	OECD, (2009). Emission scenario document on transport and storage of chemicals.	**67**
10480466	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).	**68**
11182966	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	**69**
6311218	U.S. EPA, (2004). Additives in plastics processing (compounding) – Generic scenario for estimating occupational exposures and environmental release – Draft.	**70**

Reports for Data or Information Other than Exposure or Release Data

5160114	Agency for Toxic Substances and Disease Registry (ATSDR) (2015). Toxicological profile for 1,1-dichloroethane.	**71**
5475844	Boegel, J. V. (1989). Air stripping and steam stripping. :6.107-6.118.	**72**
664488	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	**73**
3828879	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.	**74**
6311590	McLaren Environmental Engineering, (1992). Site investigation and evaluation of remedial measures report Howard Hughes Properties Plant Site, Los Angeles, California.	**75**

8347325 U.S. EPA, (2021). National Analysis TRI dataset (TRI): Data used for TSCA Risk Evaluations, reporting year 2019. **103**

11182965 VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities. **104**

Study Citation:	Arthur D. Little Inc, (1983). Summary of the chlorinated hydrocarbon sampling program.
HERO ID:	1441902
Conditions of Use:	Manufacturing

EXTRACTION

Parameter	**Data**
Exposure route:	inhalation
Personal sampling data:	”Average: 1.4 ppm High/Low: 8.7ppm / 0 ppm // Data is for 1,2DCA, did not find any 1,1DCA data”
Comments:	Number of samples: Possibly 50, unclear (pg 38)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for chloromethane manufacture, which is similar to the in-scope occupational scenario DCE manufacture. Data is for 1,2-DCA
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Cometto-Muniz, J.E., Abraham, M.H. (2015). Compilation and analysis of types and concentrations of airborne chemicals measured in various indoor and outdoor human environments. Chemosphere 127:70-86.
HERO ID:	3256955
Conditions of Use:	General indoor concentrations

EXTRACTION

Parameter	**Data**
Exposure route:	Inhalation
Area sampling data:	0.4 to 1.8 ug/m3; mean 1.1 ug/m3 in indoor commercial environments (p. 81)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified. [Methodology not specified - data was taken from other journal articles]
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from either U.S. or UK (unclear which), both OECD countries. [unclear - assumed U.S. or OECD based on authors (1 U.S, 1 UK)]
	Metric 3:	Applicability	Low	Data are for general indoor air, which may be applicable to multiple in-scope occupational scenarios. [General indoor air concentrations (homes/schools/commercial)]
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected at unclear date. Assumed 2000s per reference list, greater than 10 years old but no more than 20 years old. [date of original source unknown - references list generally contains sources from 2000s]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [range of 2 samples given]
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata. [no information about samples - data potentially available in supplementary table]
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed. [Only 2 indoor commercial samples - details unknown.]

Overall Quality Determination Low

Study Citation:	Dow Chemical, (1992). Letter from Dow Chem Co submitting several studies with trichloroethylene and other chemicals in humans with attachments (sanitized).
HERO ID:	4214362
Conditions of Use:	Domestic Manufacturing; Intermediate in all other basic organic chemical manufacturing

EXTRACTION

Parameter	**Data**
Worker activity description:	Workers in the Chlorinated Ethane Products area; specific activities for 1,1-DCA are unclear (p. 19)
Exposure route:	inhalation
Personal sampling data:	Chlorinated Ethane Products area - Eight-hour time-weighted average exposures for 1,1-dichloroethane were ”well below the recommended exposure guidelines” (p. 19).

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	Medium	Applicable to manufacturing or processing, in scope occupational scenarios, but actual process unclear
Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old (early 1990s)
Metric 5:	Sample Size	N/A	No quantified/quantifiable (i.e., graph) data provided
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Uninformative	No monitoring data provided - only indicates levels are below recommended exposure limits, which are not stated.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Uninformative

Study Citation:	Ethyl Corporation, (1981). Industrial hygiene survey Saytech Chemicals date of survey: February 23-26, 1981.
HERO ID:	1579735
Conditions of Use:	Processing

EXTRACTION

Parameter	**Data**
Worker activity description:	Reactor Operator, Centrifuge Operator, Stainless Operator
Exposure route:	Inhalation
Physical form:	Vapor
Personal sampling data:	22; 5.9; 10; 5.8; 5.4; 22; (ppm) (pg. 14) (note this is for 1,2-DCA)
Area sampling data:	8.5 (ppm) (pg. 14) (note this is for 1,2-DCA)
Exposure duration:	Duration: pg 14 (gives exact times sampling occurred, ~6-7 hours for each sample)
Comments:	Number of samples: 7. (pg14).

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data is for a chemical similar to 1,1-DCA (1,2-DCA). May be used as a surrogate chemical in the RE.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of workers, PPE, engineering controls, analytical method.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Kozik, I. V. (1957). [Problems of occupational hygiene in the use of dichloroethane in the aviation industry]. Gigiena Truda i Professional'nye Zabolevaniya 1:31-38.
HERO ID:	18135
Conditions of Use:	Use as a solvent for glue

EXTRACTION

Parameter	**Data**
Worker activity description:	Workers in the aircraft industry: gluing, preparation of tanks and different rubber articles.
Exposure route:	Inhalation
Area sampling data:	0.05 mg/L for 70-75% of the work shift and 0.08-0.15 mg/L for short periods consisting of 25-30% of the day.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Low	Data are from Russia, a non-OECD country.
	Metric 3:	Applicability	Medium	The data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by taking samples at various areas within the plant and different temperatures, but uncertainty is not addressed.

Overall Quality Determination — Low

Study Citation: Loizidou, M., Kapetanios, E. G. (1992). Study on the gaseous emissions from a landfill. Science of the Total Environment 127(3):201-210.
HERO ID: 1671226
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Worker activity description:	landfill
Exposure route:	inhalation
Personal sampling data:	0.5-14.0 (ug/m^3) (Pg. 6)
Comments:	Number of samples: 12

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Greece, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sampling events at multiple sites but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	Stantec ChemRisk, (2023). Final study report: Inhalation monitoring of 1,1-dichloroethane (CASRN 75-34-3).
HERO ID:	11350331
Conditions of Use:	Manufacturing - Isolated intermediate

EXTRACTION

Parameter	**Data**
Number of sites:	The report lists 1 site that manufactures 1,1-DCA as an isolated intermediate on PDF pages 70-71 which is contained within Appendix C.
Worker activity description:	Section 2.1 (PDF pages 15-19) lists worker activities.
Exposure route:	Inhalation is the only described exposure route.
Personal sampling data:	The report contains 63 full-shift samples and 36 task length samples for the isolated intermediate COU. Individual data points are located in Appendix O on page 249.
Exposure duration:	Table 3 on PDF page 16 which describes the duration of tasks separated by SEG. Appendix O on page 249 contains some task duration information for task length samples that were collected.
Exposure frequency:	Table 3 on PDF page 16 which describes the frequency of tasks separated by SEG. Appendix O on page 249 contains some task frequency information for task length samples that were collected.
Personal protective equipment:	A general description of PPE used in Section 3.2.3 on PDF pages 32-34 and provides specific information for the monitored employees in Appendix O on PDF page 249.
Engineering control:	A general description of Engineering Controls used in Section 3.2.1 on PDF page 31. Administrative Controls are described in Section 3.2.2 on PDF page 32.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	High	A modified NIOSH method is used
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data is collected from facilities in the United States.
	Metric 3:	Applicability	High	The data are for Manufacturing - Isolated intermediate, an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The information describes exposures and activities conducted in the past year.
	Metric 5:	Sample Size	High	Individual data points are provided
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All relevant metadata is provided
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling over multiple shifts.

Overall Quality Determination High

Study Citation: Stantec ChemRisk, (2023). Final study report: Inhalation monitoring of 1,1-dichloroethane (CASRN 75-34-3).
HERO ID: 11350331
Conditions of Use: Manufacturing - Non-isolated byproduct

EXTRACTION

Parameter	Data
Number of sites:	The report lists 11 site that manufactures 1,1-DCA as a non-isolated byproduct on PDF pages 68-71 which is contained within Appendix C.
Worker activity description:	Section 2.1 (PDF pages 15-19) lists worker activities.
Exposure route:	Inhalation is the only described exposure route.
Personal sampling data:	The report contains 98 full-shift samples and 45 task length samples for the non-isolated byproducts COU. Individual data points are located in Appendix O on page 249.
Exposure duration:	Table 3 on PDF page 16 which describes the duration of tasks separated by SEG. Appendix O on page 249 contains some task duration information for task length samples that were collected.
Exposure frequency:	Table 3 on PDF page 16 which describes the frequency of tasks separated by SEG. Appendix O on page 249 contains some task frequency information for task length samples that were collected.
Personal protective equipment:	A general description of PPE used in Section 3.2.3 on PDF pages 32-34 and provides specific information for the monitored employees in Appendix O on PDF page 249.
Engineering control:	A general description of Engineering Controls used in Section 3.2.1 on PDF page 31. Administrative Controls are described in Section 3.2.2 on PDF page 32.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	High	A modified NIOSH method is used
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data is collected from facilities in the United States.
	Metric 3:	Applicability	Medium	The data are for Manufacturing - Non-Isolated byproduct, an occupational scenario within the scope of the 1,2-DCA risk evaluation, but possibly applicable to 1,1-DCA exposure as well
	Metric 4:	Temporal Representativeness	High	The information describes exposures and activities conducted in the past year.
	Metric 5:	Sample Size	High	Individual data points are provided
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All relevant metadata is provided
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling over multiple shifts at three plants.

Overall Quality Determination High

Study Citation:	Tsiliyannis, C. A. (1999). Report: Comparison of environmental impacts from solid waste treatment and disposal facilities. Waste Management & Research 17(3):231-241.
HERO ID:	660588
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Exposure route:	inhalation
Area sampling data:	4.72 ppm (mean); 30.00 ppm (max); 6 mg/m3 (all dichloroethanes) present in biogas from landfill of municipal solid waste - additional details may be found in referenced sources: WMI, 1994 and Zannikos, 1992 (p. 4)
Comments:	>142 samples

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified - data originated from different source
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Greece, an OECD country.
	Metric 3:	Applicability	High	Data are for Disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1998) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (min, max, mean) but discrete samples not provided and distribution not fully characterized. Additional details may be available in referenced sources
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata. Additional details may be available in referenced sources
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by 42 sites and 142 samples, but uncertainty is not addressed. Additional details may be available in referenced sources

Overall Quality Determination Low

Study Citation:	Xing, L., Wang, L., Zhang, R. (2018). Characteristics and health risk assessment of volatile organic compounds emitted from interior materials in vehicles: a case study from Nanjing, China. Environmental Science and Pollution Research 25(15):14789-14798.
HERO ID:	4697151
Conditions of Use:	Emission from interior materials in vehicles

EXTRACTION

Parameter	**Data**
Worker activity description:	Source: interior of vehicles
Exposure route:	Inhalation
Area sampling data:	ND to 0.68 ug/m3, ND (median; MDL = 0.168 ug/m3), 0.03 ug/m3 mean (p. 14792)
Exposure duration:	2 hr/day; assumed 10 year exposure duration because level of VOCs decrease with time (p. 14791)
Exposure frequency:	300 dpy (p. 14791)
Comments:	Analytic method: stainless steel canisters - analyzed with high-resolution gas chromatograph-mass spectrometer (GC-MS; Agilent 7890A Series, Agilent Technologies, USA) coupled with a mass spectrometer (MSD 5975C, Agilent Technologies, USA); Method TO-15 (p. 14790).

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved EPA method. [USEPA Method TO-15]
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
Metric 3:	Applicability	Uninformative	Data are for vehicle interiors, which does not applyto any occupational scenario within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2018]
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [range provided; number of samples unclear]
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of sites and number of workers. [estimates exposure durations and frequencies]
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling randomly selected cars of varying ages. [23 randomly selected vehicles; varying ages; discussed calibration tests]

Overall Quality Determination Uninformative

Study Citation:	Frasch, H.F., Bunge, A.L. (2015). The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. Journal of Pharmaceutical Sciences 104(4):1499-1507.
HERO ID:	3230538
Conditions of Use:	All - Dermal Model

EXTRACTION

Parameter	**Data**
Dermal exposure data:	Dermal exposure data

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to all occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity				
	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty				
	Metric 6:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination High

Study Citation:	Ng, M. G., Tongeren, van, M., Semple, S. (2014). Simulated Transfer of Liquids and Powders from Hands and Clothing to the Mouth. Journal of Occupational and Environmental Hygiene 11(10):633-644.
HERO ID:	3222353
Conditions of Use:	May apply to more than 1 COU

EXTRACTION

Parameter	**Data**
Exposure route:	hand/object to mouth (inadvertent ingestion)
Physical form:	liquid and powder
Dermal exposure data:	Dermal exposure data
Exposure frequency:	pg. 2/13: Observational studies of adults have shown average hand-to-mouth contact frequencies of 2–5 contacts per hour
Comments:	This data source contains data that are the values of a variable in an equation for calculating oral exposure resulting from inadvertent ingestion. This inadvertent ingestion results from hand/object -to-mouth transfer. The variable is transfer efficiency pertaining to hand/object -to-mouth transfer. The data are laboratory measurements of transfer efficiency. pg. 12/13: "This study has provided evidence that transfer of chemicals from the hands or objects to the mouth is influenced by parameters including physical state, chemical/physical properties, and use of protective clothing. These findings may have implications for exposure modeling and exposure control. This work was preliminary in nature and additional study is required to obtain a greater understanding of the parameters that can affect transfer and the possible interactions between them."

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The equation for amount inadvertently ingested is reasonable. The method of measuring transfer efficiency is sound.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	N/A	The geographic attribute is not relevant in the case of a mathematical model and data obtained via laboratory experiments.
	Metric 3: Applicability	High	Inadvertent digestion is tentatively in scope (EPA will consider this scenario according to the Scope Documents.)
	Metric 4: Temporal Representativeness	High	The data were generated less than 10 years ago.
Domain 3: Accessibility/ Clarity			
	Metric 5: Metadata Completeness	High	Meta data is complete.
Domain 4: Variability and Uncertainty			
	Metric 6: Metadata Completeness	High	Variability and uncertainty are well characterized.

Overall Quality Determination High

Study Citation:	Dow Chemical, (1983). 1982 industrial hygiene survey environmental operations department.
HERO ID:	1973135
Conditions of Use:	Distribution in Commerce

EXTRACTION

Parameter	**Data**
Worker activity description:	Unloading chlorinated organic compounds from tank trucks; drum washing
Personal sampling data:	ND (Pg. 4) 8-hr TWA
Exposure frequency:	40 hours/week

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Medium

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.
HERO ID:	3827300
Conditions of Use:	Adhesive Application

EXTRACTION

Parameter	**Data**
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying
Exposure route:	dermal and inhalation
Area sampling data:	Dermal: Provides methods for modeling exposures to solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to mists and volatile liquids
Number of workers:	26-106 workers/site
Personal protective equipment:	chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives
Engineering control:	Spray booths

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Low	This ESD is for adhesive application and includes different methods of application of adhesives to the substrates which may have applicability to the risk evaluation
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.

Overall Quality Determination Medium

Study Citation:	OSHA, (2019). Chemical exposure health data (CEHD) sampling results: CASRNs 75-34-3, 85-68-7, 84-74-2, 78-87-5, 117-81-7, 106-93-4, 50-00-0, 95-50-1, 85-44-9, 106-46-7, 79-00-5, and 115-86-6.
HERO ID:	6499659
Conditions of Use:	Unknown

EXTRACTION

Parameter	**Data**
Exposure route:	Inhalation
Personal sampling data:	0-5.4 (ppm)
Area sampling data:	0 (ppm)
Comments:	Analyzed via GC/FID.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Assessment uses high quality data/techniques from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Condition of use is unknown.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple facilities but uncertainty is not addressed.

Overall Quality Determination — High

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).
HERO ID:	10480466
Conditions of Use:	Laboratory Chemicals

EXTRACTION

Parameter	**Data**
Worker activity description:	Container unloading (liquids and solids), container cleaning, equipment cleaning, laboratory analyses, disposal of laboratory chemicals.
Exposure route:	Dermal, Inhalation.
Physical form:	Liquid or solid.
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.
Dermal exposure data:	Dermal exposure data
Exposure duration:	8-12 hr/day .
Exposure frequency:	250 days/yr.
Number of workers:	3 workers/facility and 3 ONUs/facility.
Personal protective equipment:	Basic PPE includes wearing long sleeves (lab coats), long pants, closed-toe shoes, safety glasses or goggles, and gloves during the use of laboratory chemicals. Additional PPE may be worn depending on the level of hazard or specifics of the process.
Engineering control:	Fume hood.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination High

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	11182966
Conditions of Use:	Repackaging

EXTRACTION

Parameter	**Data**
Worker activity description:	Unloading transport containers, container cleaning, equipment cleaning, loading of transport containers.
Exposure route:	Dermal, Inhalation
Physical form:	Liquid or solid.
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.
Dermal exposure data:	Dermal exposure data
Exposure duration:	8-12 hr/day.
Exposure frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.
Number of workers:	3 workers/facility and 1 ONUs/facility (total number of employees and facilities given in Table 5-3).
Personal protective equipment:	Commonly used PPE includes safety glasses, face shields, aprons, and gloves.
Engineering control:	Local exhaust ventilation.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple worker activities.

Overall Quality Determination High

Study Citation: U.S. EPA, (2004). Additives in plastics processing (compounding) – Generic scenario for estimating occupational exposures and environmental release – Draft.
HERO ID: 6311218
Conditions of Use: Plastics compounding

EXTRACTION

Parameter	Data
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes.
Exposure route:	Dermal and inhalation.
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.
Dermal exposure data:	Dermal exposure data
Exposure frequency:	250 days/yr.
Number of workers:	24 workers/site.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Uninformative	Data are for plastics compounding which is not in-scope or similar to an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.

Overall Quality Determination Uninformative

Study Citation:	Wang, D., Yu, H., Shao, X., Yu, H., Nie, L. (2018). Direct and potential risk assessment of exposure to volatile organic compounds for primary receptor associated with solvent consumption. Environmental Pollution 233:501-509.
HERO ID:	5550004
Conditions of Use:	Adhesives and sealants

EXTRACTION

Parameter	**Data**
Exposure route:	Inhalation
Physical form:	Vapor
Area sampling data:	Acrylic primer: 18.0 (ug/m^3); Epoxy primer: 1.4 (ug/m^3); Acrylic topcoat: 26.8 (ug/m^3).

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, standard deviation, median, maximum) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple product types being tested but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	Agency for Toxic Substances and Disease Registry (ATSDR) (2015). Toxicological profile for 1,1-dichloroethane.
HERO ID:	5160114
Conditions of Use:	Various

EXTRACTION

Parameter	**Data**
Worker activity description:	chemical and allied products and business service industries, as chemical technicians; plumbers, pipefitters, and steamfitters; supervisors in production occupations; electricians; machinists; chemical engineers; and welders and cutters (p. 106) NIOSH (1978) noted that there was a large potential for exposure to 1,1-dichloroethane in the workplace during its use as a dewaxer of mineral oils, extractant for heat-sensitive substances, or fumigant, and in the manufacture of vinyl chloride and high-vacuum rubber and silicon grease. (p. 106)
Exposure route:	inhalation or dermal
Number of workers:	Up to 1,957 total people exposed during working (based on 1980-1983 NIOSH survey) (p. 23, 85, 106)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report uses high quality data (ATSDR report, references other government sources and journal articles) from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	General data for various occupational scenarios in scope.
	Metric 4: Temporal Representativeness	Low	Occupational exposure discussion is mostly based on data greater than 20 years old (1970s-80s) and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	No statistics provided, should reference original sources
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent. (should reference original sources)
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by referencing multiple government sources. Variability is not addressed.

Overall Quality Determination Medium

Study Citation:	Bender, H. F., Eisenbarth, P. (2007). Occupational safety and health at the workplace: Sections 6.1–6.8. :147-256.
HERO ID:	7309849
Conditions of Use:	All

EXTRACTION

Parameter	**Data**
Personal protective equipment:	1,1-DCA warrants an AX-filter. Unlike the classification system of gas filter classes, there are four groups to distinguish AX-filters for low boiling pollutants. These filters will immediately adsorb any low-boiling compound with which they come into contact, e. g., humidity from the air. AX-filters must be therefore be used in their delivered state immediately after opening. There must be no delay before use. Used filters can only be reused within the same work shift up to the maximum use time. Using AX-filters to remove mixtures of several low-boiling compounds is not permissible, because desorptive processes cannot be excluded. (Page 92/110) Also, spectacles, goggles, face shields, gloves, and protective clothing should be used. Many details on when to use what type of PPE is included in the report.
Engineering control:	Ventilation can be installed at sampling and filling stations, at coating machines, or for instance at extruders for polymer manufacturing. Further examples of the use of ventilation are mechanical workplaces, welding, soldering, or adhesion work. In order to achieve sufficiently effective ventilation, it must be kept in mind that the efficiency strongly decreases with increasing distance from the source of emission, approximately in proportion to the cube of the distance. (page 25/110)Local ventilation or extraction is used quite often in operations which in principle are designed as closed systems but include single, mostly short-term openings for sampling, inspections, changing of filters, or other necessary working steps. (page 37/110)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	The assessment or report uses high quality data that are not from a frequently used source and associated information does not indicate flaws or quality issues. Report cites unknown literature.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Medium	Report is from the European Economic Community, which is assumed to comprise of OECD countries.
Metric 3:	Applicability	High	Report provides general information on PPE/engineering controls, which is in scope for all COUs.
Metric 4:	Temporal Representativeness	Medium	Report is from 2007, which is between 10-20 years old.
Metric 5:	Sample Size	N/A	PPE/engineering controls cannot be characterized by statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent. Sources are cited, but works cited isn't included in the PDF.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination Medium

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.
HERO ID:	664488
Conditions of Use:	Various

EXTRACTION

Parameter	**Data**
Worker activity description:	Workers involved in the production or use of these solvents may be exposed by inhalation or by dermal contact with the liquid solvents… Inhalation is the most common exposure route for the general population, including indoor sources from such as paints, adhesives, cleaning solutions, and aerosolized insecticide sprays; from industries producing these solvents; and from contaminated waste disposal sites (pg 488)
Exposure route:	inhalation/dermal
Physical form:	vapor/aerosol/liquid

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources (CDC).
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	Medium	Data are for various in-scope occupational scenarios but not specific .
Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination Medium

Study Citation:	Cohr, K. H. (1986). Uptake and distribution of common industrial solvents. Progress in Clinical and Biological Research 220:45-60.
HERO ID:	61012
Conditions of Use:	All

EXTRACTION

Parameter	**Data**
Exposure route:	dermal
Physical form:	liquid
Dermal exposure data:	Dermal exposure data

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	High	Not specific to an in-scope OES, but generic dermal exposure data potentially applicable to multiple OESs
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1986) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively (graphical)
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination — Low

Study Citation:	Moen, B. E. (1991). Work with chemicals on deck of Norwegian chemical tankers. International Archives of Occupational and Environmental Health 62(8):543-547.
HERO ID:	5467640
Conditions of Use:	Distribution in commerce

EXTRACTION

Parameter	**Data**
Worker activity description:	Connection/ disconnection of hoses during loading/unloading chemical tanks, manual measurements of the contents of the tanks, manual measurements of the temperature of the tanks, taking samples of the cargo in the tanks, taking samples of the cargo in tanks, cleaning the tanks from the deck, cleaning the tanks by entering them, repair of leakages, spray painting (Pg. 2-Table 2)
Exposure route:	Inhalation
Exposure frequency:	Most have a working schedule where they spend 4 months at sea and 4 months at home (6 months a year, pg. 2); Days of participation for each worker activity is provided per type of worker, for example, mates spent an average of 10 days spray painting. (Table 2, pg. 2)
Personal protective equipment:	Respiratory protective equipment was used ”seldom or never” by 20 % of the seamen. This equipment was used ”sometimes” by 50 %. Only 30 % used it ”regularly” (Pg. 3)

EVALUATION

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report performs its own survey of ship workers, methods appear sound. Report describes answers provided by seamen were approximate, therefore results can be considered rough
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability was addressed by interviewing seamen from 20 different Norwegian chemical tankers and uncertainty are not addressed.

Overall Quality Determination Medium

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 6365: 1,1-Dichloroethane.
HERO ID:	10180525
Conditions of Use:	All conditions of use

EXTRACTION

Parameter	**Data**
Exposure route:	Inhalation and dermal.
Physical form:	Colorless oily liquid; mist

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for all in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Exposure routes and physical form.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - Exposure routes and physical form.

Overall Quality Determination High

Study Citation:	NIOSH, (2007). NIOSH pocket guide to chemical hazards.
HERO ID:	192177
Conditions of Use:	General Information

EXTRACTION

Parameter	**Data**
Exposure route:	Toxicologically important entry routs (i.e., not potential routes associated with an exposure scenario): Inhalation, Ingestion, Skin and/or eye contact
Physical form:	Colorless, oily liquid. This is not the physical form in the case of an occupational exposure scenario of the risk evaluation.
Comments:	Exposure Limits:NIOSH REL: TWA 100 ppm (400 mg/m3)OSHA PEL: TWA 100 ppm (400 mg/m3)

EVALUATION

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data source does not contain data that pertain to an occupational exposure scenario of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation:	NIOSH, (1979). NIOSH Current Intelligence Bulletin No. 27: Chloroethanes: Review of toxicity.
HERO ID:	64409
Conditions of Use:	May apply to more than 1 COU

EXTRACTION

Parameter	**Data**
Exposure route:	inhalation, skin absorption, and ingestion
Physical form:	liquid
Number of workers:	4,600
Personal protective equipment:	Respirators, goggles, and gloves
Engineering control:	Local exhaust ventilation

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for all in-scope occupational scenarios.
Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.

Overall Quality Determination — High

Study Citation:	NIOSH, (2018). NIOSH pocket guide to chemical hazards: 1,1-dichloroethane.
HERO ID:	646691
Conditions of Use:	All conditions of use

EXTRACTION

Parameter	**Data**
Exposure route:	Inhalation, skin and/or eye contact.
Physical form:	Colorless oily liquid.
Personal protective equipment:	Supplied air respirator for concentrations under 1,000 ppm. Supplied-air respirator in a continuous flow mode for up to 2,500 ppm. Self contained breathing apparatus or supplied air respirator with a full facepiece for up to 3,000 ppm.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for all in-scope occupational scenarios.
Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
Metric 5:	Sample Size	N/A	N/A - Exposure routes, PPE, and physical form.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	N/A - Exposure routes, PPE, and physical form.

Overall Quality Determination High

Study Citation:	NIOSH, (1978). Occupational health guideline for 1,1-dichloroethane.
HERO ID:	8435203
Conditions of Use:	Applies to more than 1 COU

EXTRACTION

Parameter	**Data**
Exposure route:	Dermal, ingestion and inhalation
Physical form:	Liquid
Personal protective equipment:	Employees should be provided with and required to use impervious clothing, gloves, and face shields.
Engineering control:	Local exhaust ventilation

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for all in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - Exposure routes, physical form, PPE, and engineering controls.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - Exposure routes, physical form, PPE, and engineering controls.

Overall Quality Determination High

Study Citation:	NLM, (2020). Hazardous agents: 1,1-Dichloroethane.
HERO ID:	7681899
Conditions of Use:	Applies to more than 1 COU

EXTRACTION

Parameter	**Data**
Exposure route:	Dermal and inhalation
Physical form:	Liquid

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	The report is for occupational scenarios within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - physical form and exposure route.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - physical form and exposure route.

Overall Quality Determination High

Study Citation:	U.S. EPA (2001). Sources, emission and exposure for trichloroethylene (TCE) and related chemicals. GRA and I:138.
HERO ID:	35002
Conditions of Use:	Intermediate; Other in all other chemical product and preparation manufacturing

EXTRACTION

Parameter	**Data**
Exposure route:	inhalation
Physical form:	liquid
Number of workers:	715 to 1,957 workers (ATSDR, 1990) (p. 101)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality methods (NIOSH) that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for processing as a reactant, solvent, and processing in formulation, but the data are not separated by COU.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1980s) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. However, original source is from NIOSH, therefore methods are assumed to be valid.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Medium

Study Citation: U.S. EPA, (2013). Updating CEB's method for screening-level estimates of dermal exposure.
HERO ID: 11224653
Conditions of Use: All

EXTRACTION

Parameter	Data
Dermal exposure data:	Dermal exposure data

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Document published by EPA CEB.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are applicable to all COUs involving dermal contact.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	N/A	N/A - Document describes general dermal exposure parameters. Sample size is not applicable.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by describing dermal exposure parameters for different exposure scenarios but uncertainty is not addressed.

Overall Quality Determination High

Study Citation:	VI, (2021). [Redacted] Submission by Vinyl Institute containing "Dry resin exposure reverse calculation" and "EDC byproduct-impurity air monitoring data review" with cover letter dated 12/1/2021.
HERO ID:	10609981
Conditions of Use:	Plastic Material and Resin Manufacturing

EXTRACTION

Parameter	**Data**
Worker activity description:	Handling dry plastic resins and finishing operations during manufacture of plastics or plastic articles. [PDF Page. 4]
Exposure route:	Inhalation [PDF Page. 4]

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic material and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Worker activity and exposure route.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - Worker activity and exposure route.

Overall Quality Determination High

Study Citation:	AS,, COWI (2018). Screening programme 2017: Suspected PBT compounds.
HERO ID:	7303021
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Wastewater from WWTPs
Release or emission factors:	Release or emission factors

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods and release quantity.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Variability addressed by sampling multiple WWTPs and uncertainty is addressed by sampling method.

Overall Quality Determination High

Study Citation: AS,, COWI (2018). Screening programme 2017: Suspected PBT compounds.
HERO ID: 7303021
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Description of release source:	Landfill runoff
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods and release quantity.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is not addressed, but uncertainty is addressed by sampling method.

Overall Quality Determination Medium

Study Citation:	Earthjustice, (2020). Exhibit 1 to comments of Rubbertown Emergency ACTion et al., Re: TSCA risk evaluations for High-Priority Substances and substances undergoing Manufacturer-Requested Risk Evaluations.
HERO ID:	10385015
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Release quantity:	SUMMARY OF AREAS [PDF Pg. 17-24]Greater Houston, TX AreaReleases: 3,955 lbsWaste Transfers Sent Off-Site: 57,316 lbsWaste Received: 58,156 lbsMossville, LA AreaReleases: 50,752 lbsWaste Transfers Sent Off-Site: 240 lbsWaste Received: 38 lbsCommunities in Cancer Alley, LAReleases: 39,856 lbsWaste Transfers Sent Off-Site: 1.126 lbsSITE SUMMARIES [PDF Pg. 48-92]Oxy Vinyls VCM Plant (LaPorte, TX)Air: 1,399 lbsIncoming Waste Transfers: 14, 711 lbsOffsite Transfer: 53,770 lbsOlin (formerly Dow) (Freeport, TX)Air: 35 lbsWater: 2 lbsOffsite Transfers: 3,331 lbsClean Harbors (LaPorte, TX)Air: 105 lbsUnderground Injection Well: 2,200 lbsIncoming Waste Transfers: 36,415 lbsOffsite Transfer: 16.30 lbsDow Chemical (Freeport, TX)Air: 37 lbsWater: 10 lbsLand: 10 lbsIncoming Waste Transfers: 3,443 lbsOffsite Transfer: 199 lbsFormosa Plastics (Point Comfort, TX)Air: 123 lbsOxy Vinyls (Deer Park, TX)Air: 34.40 lbsOccidental Chemical (Igleside, TX)Incoming Waste Transfers: 3,579 lbsWaste Management-Coastal Plains (Alvin, TX)Incoming Waste Transfers: 8.15 lbsVeolia Es Technical Solutions (Port Arthur, TX)Air: 38.3 lbsIncoming Waste Transfers: 486 lbsOffsite Transfer: 5 lbsWestlake (Westlake, LA)Air: 50,436 lbsWater: 132 lbsIncoming Waste Transfers: 5 lbsOffsite Transfer: 240 lbsChemical Waste Management (Sulphur, LA)Land: 33.30 lbsIncoming Waste Transfers: 33.30 lbsOlin (formerly Dow) (Plaquemine, LA)Air: 23,141 lbsOffsite Transfer: 220 lbsFormosa Plastics (Baton Rouge, LA)Air: 9,340 lbsShintech (Plaquemine, LA)Air: 4,143 lbsWestlake (Plaquemine, LA)Air: 1,605 lbsOffsite Transfer: 333.0 lbsOccidental Chemical (Geismar, LA)Air: 617 lbsOffsite Transfer: 573 lbsWestlake Vinyls Co (Geismar, LA)Air: 995 lbsOccidental Chemical (Convent, LA)Air: 15 lbs
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Low	Methodology is not specified.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for Disposal, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.(2012-1028)
Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability addressed by data from multiple sites, but uncertainty is not addressed.

Overall Quality Determination — High

Study Citation:	Hart, J.R. (1994). Comparison of emissions from burning hazardous waste in a dry-process cement kiln with emission from burning conventional fossil fuels. Hazardous Waste and Hazardous Materials 11(1):193-199.
HERO ID:	658817
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Hazardous waste as fuel from Cement Kiln
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1994)
	Metric 5:	Sample Size	Low	sample details not provided - report only indicated that 1,1-DCA not detected in waste stream
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Release media provided, but no other metadata provied: LOD, initial amount of 1,1-DCA in waste stream
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Hsu, Y.C., Chen, S.K., Tsai, J.H., Chiang, H.L. (2007). Determination of volatile organic profiles and photochemical potentials from chemical manufacture process vents. Journal of the Air and Waste Management Association 57(6):698-704.
HERO ID:	608305
Conditions of Use:	Manufacturing; Processing; Industrial Use

EXTRACTION

Parameter	**Data**
Description of release source:	General chemical manufacture process vents
Release or emission factors:	Release or emission factors
Release frequency:	assumes 300 operational days/yr (p. 4)
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for chemical process emissions from plastics manufacturing facilities, but for all VOCs, not specifically 1,1-DCA, which is similar to in-scope industrial occupational scenarios (manufacturing, processing, use)
	Metric 4:	Temporal Representativeness	Medium	Data are more than 10 years old (2007)
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided (assume 330 days/yr) but missing specifics on process operations
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by type of chemical manufacturing facilities and some process streams but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	Northrop Corporation, (1992). Northrop corporation aircraft division: Health risk assessment for west complex (final report) with attachments and cover letter dated 021492.
HERO ID:	1577139
Conditions of Use:	Use in aircraft manufacturing and assembly, welding, and surface coating

EXTRACTION

Parameter	**Data**
Description of release source:	Northrop Corporation Aircraft Division (El Segundo, CA) Toxic compounds are emitted by the following processes: • Degreasing activities to clean tools and parts. Emissions are due mostly to chemical solvents such as 1,1,1-trichloroethane. • Coating operations which perform spray application of paints and hand applications of adhesives and sealants. Emissions are primarily in the form of volatile organic compounds (VOCs) emitted during drying and particulate matter (PM) emitted during spraying. • Surface cleaning operations which most often use 1,1,1-trichloroethane. • Refrigerant recharge and purging of equipment lines. Emissions are fluorocarbons such as freon. • Combustion products from boilers. autoclaves. process heating ovens and space heaters.
Release quantity:	12.6 lb/yr (5.71 kg) (not specified whether 1,1-dichloroethane or 1,2-dichloroethane) (p. 25)
Release or emission factors:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Low	Methodology is not specified.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (early 1990s)
Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics - Single values for lb/hr and lb/yr provided
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata. No details on emission estimates - Emissions estimated for emissions inventory; report indicates emissions are summarized in ”Appendix C” which is not included in the PDF.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Northrop Corporation, (1992). Northrop corporation aircraft division: health risk assessment for east complex (final report) with attachments and cover letter dated 021492. 920000818:#86-920000818.
HERO ID:	4214356
Conditions of Use:	Metal finishing

EXTRACTION

Parameter	**Data**
Release quantity:	50.1 (lbs/year)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for metal finishing, which is similar to the in-scope occupational scenario solvents (for degreasing and cleaning).
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods, description of release source.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination — Low

Study Citation:	OECD, (2011). Resource compendium of PRTR release estimation techniques, part 4: Summary of techniques for releases from products, version 1.0.
HERO ID:	7348917
Conditions of Use:	Commercial & Consumer Use

EXTRACTION

Parameter	**Data**
Description of release source:	Building and construction products, Electrical and electronic products, Furniture, Nanoproducts, Packages and plastic bags, personal care and cleaning products, Textile and leather products, Toys and low-cost jewelry (page 17/109). Releases typically occur during the first use of a product, when carrying out maintenance of the product, and due to wearing, exposure to heat or light or other ageing of the product (page 63/109).
Release or emission factors:	Release or emission factors

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Medium	OECD paper provides general methods and equations used to calculate emissions, but details aren't provided.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	Medium	Data are provided by the OECD.
	Metric 3: Applicability	High	Data are for various consumer and commercial uses which are in scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Paper was published in 2011, but most emission factor data is from 2003-2004, which is greater than 10 years old.
	Metric 5: Sample Size	Low	Emission factor data is characterized by no statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Medium	Release data include release source and emission factors. Formulas for release quantity are provided. Data lacks release frequency and waste treatment methods.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

Overall Quality Determination Medium

Study Citation:	Qiu, K., Yang, L., Lin, J., Wang, P., Yang, Y., Ye, D., Wang, L. (2014). Historical industrial emissions of non-methane volatile organic compounds in China for the period of 1980-2010. Atmospheric Environment 86:102-112.
HERO ID:	2373425
Conditions of Use:	Manufacturing, Processing, Use, Distribution

EXTRACTION

Parameter	**Data**
Description of release source:	Industrial processes; industrial solvent utilization; storage and transport; other
Release quantity:	Estimated annual NMVOC emissions (1980-2010) for various general processes compared with values from other articles (see Release Source column) (p. 110)
Release or emission factors:	Release or emission factors

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Article calculated emissions in China (a non-OECD country), but emission factors primarily from USEPA and Europe (assigned mid score of 2)
	Metric 3:	Applicability	Medium	Data are for general industrial processes, which is similar to the in-scope occupational scenario for MFG and PROC (but only on NMVOC level)
	Metric 4:	Temporal Representativeness	Medium	EF dates vary from 1990s through 2000s (assigned mid score of 2)
	Metric 5:	Sample Size	Low	EFs provided for various processes, but derivation not discussed in this document
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	EFs provided for various processes, but derivation not discussed in this document
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Discusses variability with other estimates of overall NMVOC emissions in China, but does not discuss varibility and uncertainty of EFs which are likely more relevant for risk assessment

Overall Quality Determination Low

Study Citation:	Rice, R. G. (1997). Applications of ozone for industrial wastewater treatment: A review. Ozone: Science and Engineering 18(6):477-515.
HERO ID:	645742
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Industrial Wastewater Treatment
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	Media: water

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, an in-scope occupational scenario, but effectiveness of UV/Oxidation treatment on wastewater only quantifies removal for general VOCs
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1996)
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics - more information may be available in referenced source
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata - may be available in referenced source
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed - may be available in referenced source

Overall Quality Determination — Low

Study Citation:	RIVM, (2007). Ecotoxicologically based environmental risk limits for several volatile aliphatic hydrocarbons. :217.
HERO ID:	5159900
Conditions of Use:	Processing

EXTRACTION

Parameter	**Data**
Description of release source:	The main emission route is evaporation (99% of emissions), of which 52% is released during the production of l,l,l-trichloroethane, and 35% during the production of 1,2-dichloroethane. Other sources of 1,1-dichoroethane might be the biodegradation of 1,1,1-trichloroethane. Additional sources of environmental release are fugitive emissions from storage, distribution, and disposal; use as an extraction solvent and fumigant; and as a constituent of medicines and stone, clay, and glass products (ATSDR, 1990a). [Pg. 50]
Release or emission factors:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
Metric 5:	Sample Size	N/A	N/A - no sample data
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability is addressed by comparing the emission percentage from different processes but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	Roy F. Weston Inc, (1980). Characterization and fate of the discharge of priority pollutants from the Rohm and Haas Philadelphia plant into the Delaware low level collector of the Philadelphia sewer.
HERO ID:	1333014
Conditions of Use:	Manufacturing; Intermediate in all other basic organic chemical manufacturing; Intermediate in all other chemical product and preparation manufacturing; Other in all other chemical product and preparation manufacturing

EXTRACTION

Parameter	**Data**
Description of release source:	Rohm and Haas Philadelphia Plant
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for general chemical manufacturing/processing, but specific 1,1-DCA role unclear
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1980)
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics - only one data point provided
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Tsiliyannis, C. A. (1999). Report: Comparison of environmental impacts from solid waste treatment and disposal facilities. Waste Management & Research 17(3):231-241.
HERO ID:	660588
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Municipal Solid Waste Landfill
Release or emission factors:	Release or emission factors
Release frequency:	daily

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Greece, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing other metadata.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by samples collected at multiple sites, but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	U.S. EPA (2001). Sources, emission and exposure for trichloroethylene (TCE) and related chemicals. GRA and I:138.
HERO ID:	35002
Conditions of Use:	Solvent use; chemical intermediate

EXTRACTION

Parameter	**Data**
Release quantity:	Majority of all releases of 1,1-dichloroethane to the environment are air emissions; Approximately 52,000 kg of 1,1-dichloroethane are released to air from POTWs; releases of 1,1-dichloroethane to surface waters from industrial solvent use and from POTWs are approximately 2,000 kg/yr; Approximately 1,000 kg/yr of 1,1-dichloroethane are released in the effluent of POTWs; Approximately 4,000 kg/yr of 1,1-dichloroethane are released to land from sludge

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Low	The release data methodology is not specified
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	U.S. data
	Metric 3: Applicability	Medium	OES are in scope but Not specific to a particular OES.
	Metric 4: Temporal Representativeness	Low	More than 20 years old
	Metric 5: Sample Size	Low	estimated totals are provided. No other info.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty

Overall Quality Determination Low

Study Citation:	U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.
HERO ID:	10180484
Conditions of Use:	Various Solvent Uses

EXTRACTION

Parameter	**Data**
Description of release source:	Natural gas-fired reciprocating engines. PDF pg. 3-4 discusses what/how various chemicals/chemical types are emitted.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data is for an in-scope occupational scenario and contain chemical-specific emission factors.
Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (assumed mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability addressed by providing data for different engine types, but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.
HERO ID:	11181053
Conditions of Use:	All

EXTRACTION

Parameter	**Data**
Description of release source:	Provides company name and site location of release source.
Release quantity:	Provides annual and period release quantities.

EVALUATION

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Low	Methodology used by submitters to estimate release data is not known.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	DMR is U.S. based data
	Metric 3:	Applicability	High	DMR includes industries included in the scopes of multiple chemicals
	Metric 4:	Temporal Representativeness	High	DMR data are less than 10 years old.
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	DMR includes release source and release quantity, but is missing emission factors, waste treatment information, and release frequency.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including multiple years of DMR data. DMR does not address uncertainty in submitter provided data.

Overall Quality Determination Medium

Study Citation: U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.
HERO ID: 46492
Conditions of Use: Recycling

EXTRACTION

Parameter	Data
Description of release source:	Storage tank vents, condenser vents, and fugitive emissions from initial treatment, distillation, purification, storage tanks, and handling operations.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, an in-scope occupational scenario; however, data is not specific to this chemical.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean and range) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and emission factors provided but missing release amount and release days per year.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is addressed by emission factors from multiple operations, but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2019). National Emissions Inventory (NEI) [database]: CASRNs 79-00-5, 75-34-3, 107-06-2, 78-87-5, 84-61-7, 106-99-0, 106-93-4, 50-00-0, 85-44-9, 106-46-7, 85-68-7, 84-74-2, and 115-86-6.
HERO ID:	6535959
Conditions of Use:	All

EXTRACTION

Parameter	**Data**
Description of release source:	Provides unit/process of release.
Release quantity:	Provides emissions per release event.
Release frequency:	Provides annual operating time.
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	Submitters provide general method used to calculate emissions, but details not provided.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	NEI is U.S. based data.
Metric 3:	Applicability	High	NEI includes industries included in the scopes of multiple chemicals.
Metric 4:	Temporal Representativeness	High	NEI data are from 2017.
Metric 5:	Sample Size	Medium	Universe is limited to units subject to NESHAP with threshold potential to emit, although states may have different requirements; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	NEI includes release media and generally also includes daily and annual operating time, specific unit/process that is the source of release, and presence of engineering controls.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	NEI does not address variability or uncertainty in submitter provided data.

Overall Quality Determination High

Study Citation:	U.S. EPA, (1995). Chapter 4.10 commercial/consumer solvent use. AP-42: Compilation of air pollutant emission factors volume I: Stationary point and area sources.
HERO ID:	7310515
Conditions of Use:	Solvent Use

EXTRACTION

Parameter	**Data**
Description of release source:	Evaporation of an aerosol spray, evaporation after application, and direct release in the gaseous phase.
Release quantity:	National NonMethane VOC EmissionsAerosol products: 342,000 Mg/yrHousehold products: 183,000 Mg/yrToiletries: 132,000 Mg/yrRubbing compounds: 62,000 Mg/yrWindshield washing: 61,000 Mg/yrPolishes and waxes: 48,000 Mg/yrNonindustrial adhesives: 29,000 Mg/yrSpace deodorant: 18,000 Mg/yrMoth control: 16,000 Mg/yrLaundry detergent: 4,000 Mg/yr
Release or emission factors:	Release or emission factors
Release frequency:	365 days/yr

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	AP-42 is based on U.S. data
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Release media, quantity, and frequency provided but missing controls.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	High	Uncertainty addressed by addressing the inclusion of methane and nonreactive products in VOC estimates. Variability addressed by estimating emissions from multiple consumer and commercial product categories.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2021). National Analysis TRI dataset (TRI): Data used for TSCA Risk Evaluations, reporting year 2019.
HERO ID:	8347325
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Fugitive and stack air releases from manufacturing, processing, and ancillary use.
Release quantity:	Total on- and off-site releases reported are 104,413.43 pounds.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release amount provided but missing emission factors and release days per year.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is addressed by emissions from multiple facilities, but uncertainty is not addressed.

Overall Quality Determination — High

Study Citation:	Vaart, V.d., D. R., Vatvuk, W. M., Wehe, A. H. (1991). Thermal and catalytic incinerators for the control of VOCs. Journal of the Air and Waste Management Association 41(1):92-98.
HERO ID:	1376226
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Thermal and Catalytic Incineration
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	Media: Air

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for Disposal, an in-scope occupational scenario, but not 1,1-DCA specific
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1990s)
	Metric 5:	Sample Size	N/A	no quantified/quantifiable data
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	N/A	no quantified/quantifiable data
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	no quantified/quantifiable data

Overall Quality Determination Medium

Study Citation:	VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.
HERO ID:	11182965
Conditions of Use:	Manufacture

EXTRACTION

Parameter	**Data**
Release quantity:	[PDF Pg. 5] A subgroup of 15 EDC/VCM facilities released 9,360pounds of 1,1-Dichloroethane to air and water which represents approximately 99+% of overall TRI releases to air and water from the total 18 facilities reporting.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Low	Methodology is not specified.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Medium

Study Citation:	Walker, B.L., Cooper, C.D. (1992). Air pollution emission factors for medical waste incinerators. Journal of the Air and Waste Management Association 42(6):784-791.
HERO ID:	78369
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Medical Waste Incinerators
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, but not specifically for 1,1-DCA
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment method.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by samples collected at multiple sites, but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	Whittaker, K. F., Moore, A. T. (1984). Pilot scale investigations in the removal of volatile organics and phthalates from electronics manufacturing wastewater. :579-589.
HERO ID:	5740947
Conditions of Use:	Electronics Manufacturing

EXTRACTION

Parameter	**Data**
Description of release source:	wastewater
Release or emission factors:	nan
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The release data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source ofthe release.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.

Overall Quality Determination Medium

Study Citation: OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.
HERO ID: 3827300
Conditions of Use: Adhesive Application

EXTRACTION

Parameter	Data
Description of release source:	container cleaning, unloading, equipment cleaning, application losses, curing/drying, trimming
Release frequency:	50-365 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
Metric 3:	Applicability	Low	This ESD is for adhesive application and includes various methods of application which may be applicable to risk evaluation.
Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.

Overall Quality Determination Medium

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.
HERO ID:	6306753
Conditions of Use:	Manufacture, processing, use

EXTRACTION

Parameter	**Data**
Description of release source:	Stack Air: Reactor vents, distillation column vents, absorber units, strippers, sumps/decanters, dryers, cooling vents Fugitive Air: Valves, pump seals, compressor seals, pressure-relief valves, flanges/connections, open-ended lines, sampling connections Water: Drum cleaning, equipment cleaning, aqueous distillation streams, extraction, reaction water, absoprtion, solids-liquids separation, adsorption, condensation

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.
HERO ID:	6393282
Conditions of Use:	Processing - Transportation and Storage

EXTRACTION

Parameter	**Data**
Description of release source:	Filling and emptying of containers, storage, pipelines, washing and cleaning, recycling and disposal of packaging
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Low	Assessment is based on data mostly greater than 20 years old.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical forms, containers and storage system types.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).
HERO ID:	10480466
Conditions of Use:	Laboratory Chemicals

EXTRACTION

Parameter	**Data**
Description of release source:	Container unloading, container cleaning, labware equipment cleaning, during laboratory analyses, waste disposal.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination High

Study Citation: U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID: 11182966
Conditions of Use: Repackaging

EXTRACTION

Parameter	Data
Description of release source:	Transfer losses, container cleaning, equipment cleaning, transfer losses during loading.
Release quantity:	Provides methodology to estimate releases based on various parameters including: opening area of cleaning equipment, physical-chemical properties, air velocity, etc.
Release or emission factors:	Release or emission factors
Release frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering emissions from multiple activities.

Overall Quality Determination High

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – Generic scenario for estimating occupational exposures and environmental release – Draft.
HERO ID:	6311218
Conditions of Use:	Plastics compounding

EXTRACTION

Parameter	**Data**
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	Release or emission factors
Release frequency:	250 days
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data
Metric 3:	Applicability	Uninformative	Data are for plastics compounding which is not in-scope or similar to an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.

Overall Quality Determination Uninformative

Study Citation:	Agency for Toxic Substances and Disease Registry (ATSDR) (2015). Toxicological profile for 1,1-dichloroethane.
HERO ID:	5160114
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Identified in at least 673 of the 1,699 hazardous waste sites that have been proposed for inclusion on the EPA National Priorities List (NPL) (HazDat 2007). 1,1-Dichloroethane has been identified in at least 400 of the 1,760 proposed (51), final (1,323), and deleted (386) hazardous waste sites listed on the EPA Superfund NPL under the synonym 1,1-dichloroethene (CASRN: 75-34-3) and at least 26 of the 1,760 EPA Superfund NPL sites under the synonym ethylidene dichloride (CASRN: 75-34-3) (EPA 2015c; NLM 2015). However, the number of sites evaluated for 1,1-dichloroethane is not known. (p. 85)
Release or emission factors:	nan

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data (ATSDR report, references other government sources and journal articles) from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	Medium	General data for various occupational scenarios in scope.
Metric 4:	Temporal Representativeness	Medium	Releases discussion is based on data of various age (1970s-2010s) that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Low	No statistics provided, should reference original sources
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent. (should reference original sources)
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by referencing multiple government sources. Variability is not addressed.

Overall Quality Determination Medium

Study Citation:	Boegel, J. V. (1989). Air stripping and steam stripping. :6.107-6.118.
HERO ID:	5475844
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Description of release source:	Industrial aqueous wastes
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing different stripping techniques/configurations, but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.
HERO ID:	664488
Conditions of Use:	Various

EXTRACTION

Parameter	**Data**
Description of release source:	These volatile halogenated solvents may be released into the air from facilities that produce or use them, from contaminated waste water, or from hazardous waste sites... Because of their volatility, these halogenated solvents generally do not persist in soil or water. (pg 487-88)
Comments:	media: air, land, water

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources (CDC).
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for various in-scope occupational scenarios but not specific.
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination Medium

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.
HERO ID:	3828879
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.

Overall Quality Determination High

Study Citation:	McLaren Environmental Engineering, (1992). Site investigation and evaluation of remedial measures report Howard Hughes Properties Plant Site, Los Angeles, California.
HERO ID:	6311590
Conditions of Use:	Aircraft component production/R&D/testing (pg 22) [cleaning and degreasing solvents, pg 88]

EXTRACTION

Parameter	**Data**
Description of release source:	"Fire training burn pit [west end of property, pg 81], salvage yard underground sumps [west, east and northeast of building 23, pg 76-80], former drum storage area [west of building 947, pg 81], storm drain discharge area, building 12 clarifiers and test sump, building 15 utility trenches and sump [and clarifier, pg 75], buidling 14 clarifiers, Building 11 tanks [underground tanks west of building 11, pg 78], building 35 organics sump, underground tank south of buidling 5, underground tanks north of building 12, clarifier south of building 21 (pg 24-25); southwest corner of building 6 (liquid waste neutralization pit), west of building 11 (oil and grease pit area), area north of building 31 and south of runway (engine cleaning pits area), Building 32 Surface Runoff Area, Purged fuel storage area (west of building 45), Temporay drum storage area (building 29), Test site 2 and 3 (pg 73-81) "
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	media: land (groundwater); fugitive air (volatilization)pg 98-267 has soil/groundwater sampling results, not emission factors but may be usable, more groundwater/soil sampling results presented throughout, e.g. App. B

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources (TSCA submission; references EPA analytical methods for soli/grounderwater sampling analysis).
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	Low	Data are for cleaning and degreasing solvents, an in-scope occupational scenario. But most of the information is for soil/groundwater sampling results and treating contaminated groundwater, which are not in-scope.
Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	N/A	Does not apply to information extracted from the source.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	Does not apply to information extracted from the source.

Overall Quality Determination Medium

Study Citation:	Vaart, D.v., Marchand, E.G., Bagely-Pride, A. (1994). Thermal and catalytic incineration of volatile organic compounds. Critical Reviews in Environmental Science and Technology 24(3):203-236.
HERO ID:	1010207
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	Media: air

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	The report's references are not from frequently used sources and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, an in-scope occupational scenario but the data are not 1,1-DCA specific
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1994)
	Metric 5:	Sample Size	N/A	No quantified/quantifiable data provided
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	No quantified/quantifiable data provided

Overall Quality Determination Medium

Study Citation: OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.
HERO ID: 3827300
Conditions of Use: Adhesive Application

EXTRACTION

Parameter	Data
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr
Process description:	unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing
Throughput:	50-365 days/yrProvides methodology for estimating throughput based on the amount of adhesived used, and the concentration of the chemical in the formulation
Number of sites:	541-22,294
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
Metric 3:	Applicability	Low	This ESD is for adhesive application and includes different methods of adhesive application which may have applicability for the risk evaluation
Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.

Overall Quality Determination Medium

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.
HERO ID:	6306753
Conditions of Use:	Manufacture, processing, use

EXTRACTION

Parameter	**Data**
Process description:	General synthesis process consists of reaction, handling/transportation, isolation, handling/transportation, purification, handling/transportation, then either reaction to make another chemical or on to the next life cycle stage

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted (process description only)
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted (process description only)

Overall Quality Determination Medium

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.
HERO ID:	6393282
Conditions of Use:	Processing - Transportation and Storage

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	UK: 11 million tonnes shipped via rail tankers 30 million tonnes shipped via pipelines
Process description:	On-site storage of chemicals, filling of containers, transport to distributors/downstream users/consumers, containers with residual chemical transported to recycling/cleaning or disposal site, empty/cleaned containers returned to distributor or production site
Number of sites:	Container cleaning sites in UK: 40 for road tankers; 8 for steel drums; 8 for plastics drums; 6 for fibre drums; 13 for IBCs; 7 for hazardous waste containers

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data mostly greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical forms, containers and storage system types.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).
HERO ID:	10480466
Conditions of Use:	Laboratory Chemicals

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	Provides methodology to estimate annual use rate.
Process description:	Receive chemicals, weigh or measure chemical, add chemical to labware, dilute/add other laboratory chemicals, add sample, run analytical testing, dispose of sample and laboratory chemical waste.
Throughput:	255 grams reagent/site-day (average); 2,000 mL reagent/site-day (average); Table 3-2 gives daily throughput for laboratory stock solutions.
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, annual throughput - 40,639 total establishments.
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different chemical functions.

Overall Quality Determination High

Study Citation: U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID: 11182966
Conditions of Use: Repackaging

EXTRACTION

Parameter	Data
Production, import, or use volume:	Table B-1 presents PMN data on repackaging rate in kg chemical/site-yr.
Process description:	Pre-manufacture notices (PMN) submitted from 2010 to 2020 under EPA's New Chemicals Program indicated imported and repackaged chemicals can be solids or liquids and may be neat or in solutions/mixtures and contained in various packaging types. After they arrive at the repackaging site, repackaging operations occur where the chemical is transferred from the transport container it was imported in to a new one of a different size in order to meet the customer's needs (JACO, 2021). Chemicals may also be transferred from original containers to intermediate storage containers before packaging into smaller containers (Cooke, 2013; NIOSH, 2009). Chemicals are expected to be received at repackaging sites in drums or larger bulk containers (supersacks, totes, tank trucks, etc.) (Cooke, 2013; NIOSH, 2009). The chemical of interest may be received in its final formulation and transferred directly from these large containers into smaller containers, charged to a temporary storage tank, or it may be charged to a mixing tank and diluted or mixed with other chemicals before it is repackaged. Once the chemical has been formulated to desired specifications, it can be repackaged. Workers may be potentially exposed during the unloading of chemicals from the original transport containers into temporary storage or new transport containers. Releases of chemicals may also occur during this stage, from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and original transport container disposal.Repackaging operations for liquid chemicals typically involve pouring or pumping the product from the original containers or mixing /storage tanks into the new containers. A study conducted by the Health and Safety Laboratory in the U.K. investigated two chemical repackaging sites (Cooke, 2013). At both of these sites the chemical was delivered to the site by road tanker and pumped into dedicated storage tanks. One of the sites, a hydrazine supplier, pumped the hydrazine into a mixing vessel where it was diluted with water and packaged into smaller containers for sale to customers. At the other site, trichloroethylene was pumped from storage tanks into a closed loop system where workers using a hydraulic lance connected to a semi-automated filling system transferred the chemical into new containers (Cooke, 2013). The usual process for repackaging solid chemicals differs from the processes for liquids. A NIOSH Health Hazard Evaluation Report (HHE) from 2009 investigated a repackaging facility that was transferring bulk shipments of silane-coated glass beads ranging between 0.2 – 1.2mm in diameter. At this facility, 2,200 lb supersacks of the product are lifted with a forklift over a metal bin, then cutting the bottom of the container with a knife to empty the beads into the bin. The metal bin is then lifted by a forklift, and the glass beads are poured into hoppers. From the hoppers the beads are gravity fed into smaller cardboard boxes or paper sacks that are shipped to customers (NIOSH, 2009). Workers may be potentially exposed during the transfer of chemicals from temporary storage into new transport containers. Releases of chemicals may also occur during this stage from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and cleaning any equipment that was used in during the process.
Number of sites:	Table 1-2 presents the number of repackaging sites based on 2019 U.S. Census data.
Chemical concentration:	A fraction of completed IRERs from 2010-2020 were reviewed, 21 submissions contained information on chemical repackaging. In these submissions, chemicals were repackaged at concentrations ranging from 1% to 100%, with a 50th percentile of 93%, a 95th percentile of 100%, and a mode of 100%.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).

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Study Citation: U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID: 11182966
Conditions of Use: Repackaging

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple repackaging facilities.

Overall Quality Determination — High

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – Generic scenario for estimating occupational exposures and environmental release – Draft.
HERO ID:	6311218
Conditions of Use:	Plastics compounding

EXTRACTION

Parameter	**Data**
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Uninformative	Data are for plastics compounding which is not in-scope or similar to an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.

Overall Quality Determination Uninformative

Study Citation:	Agency for Toxic Substances and Disease Registry (ATSDR) (2015). Toxicological profile for 1,1-dichloroethane.
HERO ID:	5160114
Conditions of Use:	Manufacturing

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	Provided data from CDR, IUR, and TRI (p. 81-82) The largest individual use of 1,1-dichloroethane is as an intermediate in the manufacture of 1,1,1-trichloroethane (Dreher et al. 2014; HSDB 2012). 1,1-Dichloroethane also has limited use as a solvent for plastics, oils, and fats, and is thus employed as both a cleaning agent and a degreaser (O'Neil et al. 2006). In the past, 1,1-dichloroethane was used as an anesthetic (HSDB 2012; O'Neil et al. 2006). Other uses of 1,1-dichloroethane include fabric spreading, varnish and finish removers, organic synthesis, ore flotation, and as a fumigant and insecticide spray (HSDB 2012). 1,1-Dichloroethane is also used in the manufacture of plastic wrap, adhesives, and synthetic fiber (USGS 2006a). No information is available regarding the use proportions among these categories. (p. 82)
Process description:	Process described on p. 81
Number of sites:	3 manufacturing/import sites from 2014 CDR (p. 81)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report uses high quality data (ATSDR report, references other government sources and journal articles) from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	General data for various occupational scenarios in scope.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and presents facility data both older/more recent than 10 years (between 6 - 15 years old).
	Metric 5: Sample Size	Low	No statistics provided, should reference original sources
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent. (should reference original sources)
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by referencing multiple government sources. Variability is not addressed.

Overall Quality Determination Medium

Study Citation: Cowfer, J. A., Gorensek, M. B. (2006). Vinyl chloride.
HERO ID: 6301240
Conditions of Use: Manufacture

EXTRACTION

Parameter	Data
Process description:	Chlorinated by-products of ethylene oxychlorination typically include 1,1,2- trichloroethane; chloral [75-87-6] (trichloroacetaldehyde); trichloroethylene [7901-6]; 1,1-dichloroethane; cis- and trans-1,2-dichloroethylenes [156-59-2 and 156-60-5]; 1,1-dichloroethylene [75-35-4] (vinylidene chloride); 2-chloroethanol 10 [107-07-3]; ethyl chloride; vinyl chloride; mono-, di-, tri-, and tetrachloromethanes (methyl chloride [74-87-3], methylene chloride [75-09-2], chloroform, and carbon tetrachloride [56-23-5]); and higher boiling compounds.By-products from EDC pyrolysis typically include acetylene, ethylene, methyl chloride, ethyl chloride, 1,3-butadiene, vinylacetylene, benzene, chloroprene, vinylidene chloride, 1,1-dichloroethane, chloroform, carbon tetrachloride, 1,1,1-trichloroethane [71-55-6], and other chlorinated hydrocarbons.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data older than 10 years old but less than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation:	Dow Chemical, (1991). Occupational health summary report - Unit I (vinyl chloride production) with cover sheets and letter dated 062091 (sanitized).
HERO ID:	5447147
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing; Intermediate in all other chemical product and preparation manufacturing

EXTRACTION

Parameter	**Data**
Process description:	Vinyl Chloride Monomer Production Plant (p. 7)
Chemical concentration:	Indicates that 1,1-dichloroethane is present as a byproduct, but submission does not include in the list of chemicals with monitoring data. (p. 8)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	Data are for manufacturing or processing, both in-scope occupational scenarios, but the specific process is unclear.
	Metric 4:	Temporal Representativeness	Low	Data greater than 20 years old.
	Metric 5:	Sample Size	N/A	General production information
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination Medium

Study Citation:	Dreher, E. L., Beutel, K. K., Myers, J. D., Lübbe, T., Krieger, S., Pottenger, L. H. (2014). Chloroethanes and chloroethylenes. :1-81.
HERO ID:	4293766
Conditions of Use:	MFG

EXTRACTION

Parameter	**Data**
Process description:	Basic feedstocks for the production of chlorinated ethanes and ethylenes are ethane or ethylene and chlorine. HCl can be used as a chlorine source when oxychlorination or acetylene hydrochlorination are employed (Fig. 2). The availability of ethane and propane from natural gas and ethylene from naphtha feedstocks has shifted the production of chlorinated C2 hydrocarbons in the Western World from the old carbide–acetylene–vinyl chloride route toward the ethylene route since World War II. The use of ethanol derived from biomass as a starting material has become of interest to reduce the carbon dioxide footprint. Ethanol can be produced from syngas derived from coal gasification with subsequent catalytical dehydration of ethanol to ethylene... Because chlorine is usually needed as a second feedstock, most plants producing chlorinated hydrocarbons are connected to a chloralkali electrolysis unit. The chlorine value of the hydrogen chloride produced as a byproduct in most chlorination processes can be recovered by oxychlorination techniques, hydrochlorination reactions (for synthesis of methyl and ethyl chloride) or, less economically, by aqueous HCl electrolysis. A minor but highly valuable outlet is ultrapure-grade anhydrous HCl used for etching in the electronic industry. (pg 3-4)Hydrogen chloride and vinyl chloride obtained from 1,2-dichloroethane cracking (see Section 2.1.3.2) are reacted in a boiling-bed-type reactor [37] in the presence of a Friedel–Crafts catalyst, preferably ferric chloride (FeCl3). 1,1-Dichloroethane is used as solvent and the temperature ranges from 30 to 70C. (more detail pg 8-9)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S. and other OECD countries.
	Metric 3: Applicability	High	Data are for MFG, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation:	Inc, E.A. (1984). Groundwater and wastewater monitoring report with cover letter dated 120385.
HERO ID:	1335577
Conditions of Use:	Domestic Manufacturing

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	1,I-Dichloroethane, CH3CHC12, is not reported to be produced commercially in the United States, but it is imported for use as a solvent and cleaning agent in specialized industrial processes. (p. 70)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report uses high quality data (NIOSH, 1978) from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for Manufacturing/Import, in-scope occupational scenarios but are not specific enough and not easy to apply
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated. (1980s)
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics (single value).
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.
HERO ID:	3828879
Conditions of Use:	Processing as an intermediate in all other basic organic chemical manufacturing

EXTRACTION

Parameter	**Data**
Process description:	The primary commercial process for 1,1,1-trichloroethane production is a two-step process based on vinyl chloride as a feedstock (81). Vinyl chloride is reacted with HCl, typically in the liquid phase in the presence of a Lewis acid catalyst, to produce 1,1-dichloroethane. After purification, the 1,1-dichloroethane is chlorinated, either thermally or by a photochlorination process, to produce the desired product and coproduct HCl. The HCl from the chlorination step is recycled to the hydrochlorination step to keep the overall process in balance. The major byproduct of the chlorination step is 1,1,2-trichloroethane.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation: NCBI, (2020). PubChem Compound Summary for CID 6365: 1,1-Dichloroethane.
HERO ID: 10180525
Conditions of Use: Manufacture

EXTRACTION

Parameter	Data
Production, import, or use volume:	U.S. national aggregate volume in 2011 was 1,000,000 - 10,000,000 pounds [PDF Pg. 42].
Life cycle description:	1,1-Dichloroethane is an important commercial chemical. It is used to make other chemical products and in the manufacture of plastic wrap, adhesives, and synthetic fibers. It is sometimes used as a solvent for paints and degreasers. It has been used as an anesthetic but that use has been discontinued due to heart risks. [PDF Pg. 2]
Process description:	1,1-Dichloroethane may be obtained by ethane or chloroethane chlorination. This chlorination can be carried out as thermal chlorination, photochlorination, or oxychlorination. These processes, however, are impaired by a lack of selectivity.1,1-Dichloroethane can be produced from acetylene by adding 2 mol of hydrogen chloride. For the first reaction sequence, i.e., the formation of vinyl chloride, mercury catalyst is typically used, although other nonmercuric catalysts are claimed in the literature.1,1-Dichloroethane via the 1,2-Dichloroethane-Vinyl Chloride Route. Hydrogen chloride and vinyl chloride obtained from 1,2- dichloroethane cracking are reacted in a boiling-bed-type reactor in the presence of a Friedel-Crafts catalyst, preferably ferric chloride.[PDF Pg. 41]
Chemical concentration:	Manufactured 1,1-DCA is reagent grade; 99.7% pure. [PDF Pg. 42].

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
Metric 5:	Sample Size	N/A	NA- data has no samples except concentration which is based on definition of reagent grade.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation: Reed, D. J. (2000). Chlorocarbons and chlorohydrocarbons, survey.
HERO ID: 7310689
Conditions of Use: Manufacture

EXTRACTION

Parameter	Data
Production, import, or use volume:	U.S. Demand1987: 68,000 tons1992: 79,000 tons
Process description:	Dehydrochlorination of 1,1,2-trichloroethane [25323-89-1] produces vinylidene chloride (1, 1- dichloroethylene). Addition of hydrogen chloride to vinylidene chloride in the presence of a Lewis acid, such as ferric chloride, generates 1, 1, 1-trichloroethane. Thermal chlorination of 1,2- dichloroethane is one route to commercial production of trichloroethylene and tetrachloroethylene. Manufacturing processes for C1 and C2 chlorohydrocarbons is shown on PDF Pg. 5.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination High

Study Citation:	RIVM, (2007). Ecotoxicologically based environmental risk limits for several volatile aliphatic hydrocarbons. :217.
HERO ID:	5159900
Conditions of Use:	Processing

EXTRACTION

Parameter	**Data**
Life cycle description:	(ATSDR, 1990a) reported that the main use of l,l-dichloroethane is as an intermediate in the manufacture of other products such as choroethylene, l,l,l-trichloroethane, and to a lesser extent high vacuum rubber. A limited use was reported as a solvent for plastics, oils, and fats, and thus is employed as both a cleaning agent and a degreaser. Other uses of l,l-dichloroethane include fabric spreading, varnish and finish removers, organic synthesis, ore flotation, and as a fumigant and insecticide spray (ATSDR, 1990a).

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for processing, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.

Overall Quality Determination — High

Study Citation:	RIVM, (2007). Ecotoxicologically based environmental risk limits for several volatile aliphatic hydrocarbons. :217.
HERO ID:	5159900
Conditions of Use:	Manufacture

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	45.5*10^6 (kg) Pg. 50

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	No sample data.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.

Overall Quality Determination High

Study Citation:	Stangroom, S. J., Collins, C. D., Lester, J. N. (1998). Sources of organic micropollutants to lowland rivers. Environmental Technology 19(7):643-666.
HERO ID:	659430
Conditions of Use:	Manufacture

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	70,000 (tons) production in US in 1976 (Pg. 6)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination — Low

Study Citation:	Troisi, F., Cavallazzi, D. (1961). Fatal poisoning from inhalation of dichloroethane vapors. La Medicina del Lavoro 52:612-618.
HERO ID:	17899
Conditions of Use:	Processing as a reactant

EXTRACTION

Parameter	**Data**
Process description:	The production process began by mixing large amounts of acetylketogluconic acid QOOOkg), dichloroethane (1000 liters) and methyl alcohol (100 liters) in a reaction boiler; the last compound was saturated with gaseous hydrochloric acid. The mixture was heated to 60°C for 30 hours and then cooled to 15°C and transferred to centrifuges; crude ascorbic acid remained after centrifugation. In unloading the reaction boiler contents into the centrifuges and unloading the crude acid from the centrifuges, the worker was exposed to inhalation of dichloroethane vapors.
Throughput:	1000L dichloroethane

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	Medium	Data are from Italy, an OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated. (1961)
	Metric 5:	Sample Size	Medium	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Medium

Study Citation:	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.
HERO ID:	11138808
Conditions of Use:	Manufacturing, Processing, Use

EXTRACTION

Parameter	**Data**
Number of sites:	Facilities by industry
Number of workers:	Workers by industry

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Data from the U.S. Census Bureau
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data from US
	Metric 3:	Applicability	High	Data applies to relevant COUs
	Metric 4:	Temporal Representativeness	High	Data from 2021
	Metric 5:	Sample Size	High	Statistics fully described
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Document itself does not describe assessment methods - likely available on Census website
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Document itself does not describe assessment methods - likely available on Census website

Overall Quality Determination High

Study Citation:	U.S. EPA (2001). Sources, emission and exposure for trichloroethylene (TCE) and related chemicals. GRA and I:138.
HERO ID:	35002
Conditions of Use:	Domestic Manufacturing

EXTRACTION

Parameter	**Data**
Chemical concentration:	'produced as reagent grade, 99.7% pure (p. 97)

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources (EPA source) and there are no known quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S. (EPA original source)
	Metric 3:	Applicability	High	Data are for Manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1980) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination Low

Study Citation:	U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.
HERO ID:	10180484
Conditions of Use:	Various Solvent Uses

EXTRACTION

Parameter	**Data**
Process description:	3 design classes: 2-cycle (stroke) lean-burn, 4-stroke lean-burn, and 4-stroke rich-burn (described in more detail PDF pg 2).
Physical form:	Gas.
Comments:	Note that only Section 3.2 of Chapter 3 of the AP-42 document was screened.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (AP-42).
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	Not applicable - Process description/physical form.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing different engine types but uncertainty is not addressed.

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.
HERO ID:	10366189
Conditions of Use:	Manufacturing, Processing, and Use

EXTRACTION

Parameter	**Data**
Production, import, or use volume:	<1,000,000,000 lb
Number of sites:	2
Chemical concentration:	1% - < 30% or 90%+
Physical form:	liquid

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	EPA database - information provided from submitters
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	US Data
Metric 3:	Applicability	High	Relevant for MFG
Metric 4:	Temporal Representativeness	High	Data from 2019
Metric 5:	Sample Size	Medium	Discrete data provided
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Information directly from submitters
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	No variability or uncertainty

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.
HERO ID:	11181053
Conditions of Use:	All

EXTRACTION

Parameter	**Data**
Number of sites:	The dataset provides the number of sites with NPDES permits that are required to report to DMR.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Data is from DMR, a frequently used EPA source.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	DMR data are from the U.S.
	Metric 3:	Applicability	High	Data are for all in-scope COUs.
	Metric 4:	Temporal Representativeness	High	Data are less than 10 years old.
	Metric 5:	Sample Size	N/A	Number of sites not based on sampling data.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Submissions do not include method of how number of sites were determined or reported. There may be sites that release the chemical of interest, but do not report to DMR.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including number of site data from multiple reporting years. Uncertainty isn't addressed.

Overall Quality Determination — High

Study Citation:	U.S. EPA, (2000). Letter from vulcan chemicals to usepa submitting comments concerning 1,1-dichloroethane and 1,1,2,2-tetrachloroethane as well as the proposed 14-day subacute oral testing procotol.
HERO ID:	1973157
Conditions of Use:	Processing as an intermediate

EXTRACTION

Parameter	**Data**
Process description:	Both 1,1-dichloroethane (a-Di) and 1,1,2,2-tetrachloroethane (sym-tet) are associated with the production of 1,1,1-trichloroethane, [methyl chloroform]. a-Di is an intermediate in the production of methyl chloroform, while sym-tet is an incidentally generated by-product of the manufacturing process. Vulcan does not produce either chemical as a commercial product and the potential for release into the environment is limited. a-Di is converted into the methyl chloroform in a chlorination reactor and all unreacted a-di is recycled to the reactor. The purification of methyl chloroform is accomplished via distillation which leaves the high boiling sym-tet in the heavy ends distillation bottoms. Due to a significant difference in boiling points between sym-tet and methyl chloroform, i.e., 146 deg C versus 74 deg C for methyl chloroform, essentially all of the sym-tet by-product remains in the distillation bottoms. The heavy ends resulting from the purification of methyl chloroform are used asfeedstock for Vulcan's perchloroethylene/carbon tetrachloride process. No sym-tet is observed in the heavy ends from the latter process, which are destroyed by incineration.

EVALUATION

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.
HERO ID:	46492
Conditions of Use:	Recycling

EXTRACTION

Parameter	**Data**
Process description:	A general waste solvent reclamation scheme with emission points is given on PDF Pg. 583.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for recycling, an in-scope occupational scenario; however, data is not specific to this chemical.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted

Overall Quality Determination Medium

Study Citation:	U.S. EPA, (2021). National Analysis TRI dataset (TRI): Data used for TSCA Risk Evaluations, reporting year 2019.
HERO ID:	8347325
Conditions of Use:	Disposal

EXTRACTION

Parameter	**Data**
Number of sites:	25 facilities report to the TRI.

EVALUATION

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Sample distribution is given by discrete samples (facility names and locations).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination High

Study Citation: VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.
HERO ID: 11182965
Conditions of Use: Manufacture

EXTRACTION

Parameter	Data
Process description:	About 1.25 pounds of mixed chlorinated organic liquids are unintentionally produced per 100 pounds of EDC manufactured. Because these substances are impurities, the production process is designed to remove them from the finished product using a separation process based on differences between the boiling point of EDC and the boiling points of these three substances.Impurities inadvertently produced during EDC manufacture are predominantly converted via other processes into various feedstocks such as HCl, or used in co-located perchloroethylene units, or destroyed by thermal oxidation with minimal if any direct worker exposure. At most facilities, both the light and heavy end liquids recovered are typically used as feedstocks in a RCRA permitted furnace or Hazardous Waste Incinerator to produce stronger HCl for oxychlorination feedstock or weaker muriatic acid, or the recovered light and heavy end liquids are used in the Catoxid® process to manufacture anhydrous HCl, which is returned as a feedstock with its coproduct EDC to the front of the oxychlorination EDC process. [PDF Pg. 2-3]
Number of sites:	15 EDC/VCM facilities released 1,1-DCA.
Chemical concentration:	Composition, given in weight % [PDF Pg. 4]Light Ends: 1-30Heavy Liquid Ends: 0-21EDC Product: 0-<0.1VCM Manufacture: 0Yields lb/100lb EDC produced) [PDF Pg. 4]Light Ends: 0.03-0.094Heavy Liquid Ends: 0-0.197EDC Product: 0-0.1VCM Manufacture: 0

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
Metric 5:	Sample Size	Medium	Data are presented as a range.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability is addressed by presenting concentrations and yields in light ends, heavy ends, EDC product and VCM product but uncertainty is not addressed.

Overall Quality Determination High