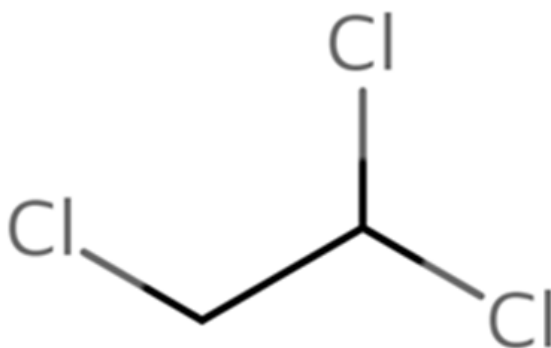

**Draft Data Quality Evaluation and Data Extraction Information for
Environmental Release and Occupational Exposure for
1,1,2-Trichloroethane**

Systematic Review Support Document for the Draft Risk Evaluation

CASRN: 79-00-5



May 2026

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 1,1,2-Trichloroethane* 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* (referred to hereafter as the '2021 Draft Systematic Review Protocol').

Data that met the RESO (Receptors, Exposure, Setting or Scenario, and Outcomes) 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.

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HERO ID	Reference	Page
Occupational Exposure		
Monitoring Data		
3118882	Burlington Indus Inc, (1982). Solvent exposure monitoring Durham Plant, August 21, 1980 with cover letter.	11
1332988	Carbide,, Union (1988). Feasibility study on six chemicals with attachments and cover letter dated 081588.	12
832709	Chiang, H. L., Lin, W. H., Lai, J. S., Wang, W. C. (2010). Inhalation risk assessment of exposure to the selected volatile organic compounds (VOCs) emitted from the facilities of a steel plant. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 45(11):1397-1405.	13
3256955	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.	14
1973135	Dow Chemical, (1983). 1982 industrial hygiene survey environmental operations department.	15
4214220	Dow Chemical, (1983). Chemical exposure evaluation: Trichloroethylene production plant (sanitized).	16
4214362	Dow Chemical, (1992). Letter from Dow Chem Co submitting several studies with trichloroethylene and other chemicals in humans with attachments (sanitized).	17
5245498	Harkov, R., Gianti, S. J., Bozzelli, J. W., Laregina, J. E. (1985). Monitoring volatile organic compounds at hazardous and sanitary landfills in New Jersey. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 20(5):491-502.	18
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12810919	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,1,2-trichloroethane (CASRN 79-00-5).	21
21711	Wallace, L. A., Pellizzari, E., Hartwell, T., Rosenzweig, M., Erickson, M., Sparacino, C., Zelon, H. (1984). Personal exposure to volatile organic compounds I Direct measurements in breathing-zone air, drinking water, food, and exhaled breath. Environmental Research 35(1):293-319.	22
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3230538	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.	25
3222353	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.	26
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5447147	Dow Chemical, (1991). Occupational health summary report - Unit I (vinyl chloride production) with cover sheets and letter dated 062091 (sanitized).	28

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3974905	NIOSH, (1985). Health hazard evaluation report no. HETA-84-214-1633, Sheldahl, Inc., Northfield, Minnesota.. NIOSH(HETA-84-214-1633):84-214.	29
3827299	OECD, (2009). Emission scenario document on adhesive formulation.	30
3827300	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.	31
5185306	OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.	32
6387322	OECD, (2012). Emission scenario document on chemicals used in oil well production.	33
6499659	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.	34
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11182966	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	36
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6406226	U.S. EPA, (1982). An exposure and risk assessment for trichloroethanes.	38
7311175	U.S. EPA, (2000). Generic scenario on lube oil additives.	39
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13246145	Santa Cruz Biotechnology, (2019). Safety Data Sheet (SDS): 1,1,2-Trichloroethane.	45
664488	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	46
61012	Cohr, K. H. (1986). Uptake and distribution of common industrial solvents. Progress in Clinical and Biological Research 220:45-60.	47
1441931	Dow Chemical, (1988). Mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant with cover letter dated 050389.	48
664480	Dow Chemical, (1991). Letter to USEPA regarding enclosed document concerning the complete review of a medical surveillance and related data concerning Dow Chemical Company employees.	49
7306151	Lewis, R. J., Sr (2012). 1,1,2-Trichloroethane 79-00-5. :1-5.	50
7681897	NCBI, (2020). PubChem Compound Summary for CID 6574, 1,1,2-Trichloroethane.	51
6305761	NICNAS, (2013). IMAP single assessment report: Ethane, 1,1,2-trichloro-: Human health tier II assessment.	52
192177	NIOSH, (2007). NIOSH pocket guide to chemical hazards.	53
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5476924	NIOSH, (1981). Permeation of protective garment materials by liquid halogenated ethanes and a polychlorinated biphenyl.	55
5908875	NIOSH, (1983). In-depth industrial hygiene survey report of the arrow shirt company Atlanta, Georgia no: 125.12 (36). 14:B2-14.	56
64409	NIOSH, (1978). Current intelligence bulletin 27 Chloroethanes: review of toxicity.	57

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8673774	NIOSH, (1994). Table of Immediately Dangerous to Life or Health Concentrations (IDLH): 1,1,2-Trichloroethane.	59
10143330	NLM, (2020). Hazardous agents: 1,1,2-Trichloroethane.	60
63098	Parker, J. C., Casey, G. E., Bahlman, L. J., Leidel, N. A., Rose, D., Stein, H. P., Thomas, A. W., Lane, J. M. (1979). Chloroethanes: Review of toxicity. American Industrial Hygiene Association Journal 40(3):A46-A60.	61
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10366189	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.	63
11224653	U.S. EPA, (2013). Updating CEB's method for screening-level estimates of dermal exposure.	64
1257697	U.S. EPA, (2011). Provisional Peer-Reviewed Toxicity Values for 1,1,2-trichloroethane (CASRN 79-00-5).	65
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3572863	Atasoy, E., Döğeroğlu, T., Kara, S. (2004). The estimation of NMVOC emissions from an urban-scale wastewater treatment plant. Water Research 38(14-15):3265-3274.	69
6301240	Cowfer, J. A., Gorenssek, M. B. (2006). Vinyl chloride. :1-31.	70
659922	Dempsey, C. R. (1993). A comparison of organic emissions from hazardous waste incinerators versus the 1990 toxics release inventory air releases. Journal of the Air and Waste Management Association 43(10):1374-1379.	71
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5159900	RIVM, (2007). Ecotoxicologically based environmental risk limits for several volatile aliphatic hydrocarbons. :217.	83
659430	Stangroom, S. J., Collins, C. D., Lester, J. N. (1998). Sources of organic micropollutants to lowland rivers. Environmental Technology 19(7):643-666.	84
13246146	U.S. EPA, (2023). Discharge Monitoring Report (DMR): 1,1,2-Trichloroethane, reporting years 2019-2023.	85
13246147	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.	86
13246148	U.S. EPA, (2020). National Emissions Inventory (NEI): 1,1,2-Trichloroethane, reporting years 2017 and 2020.	87
46492	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.	88
5097885	U.S. EPA, (2015). Chapter 5: Petroleum industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.	89
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.	90
7306159	U.S. EPA, (1990). Final best demonstrated available technology (BDAT) background document addendum for F002 (1,1,2-trichloroethane) and F005 (benzene, 2-ethoxyethanol and 2-nitropropane).	91
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7325487	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.	94
8347325	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.	95
8784984	U.S. EPA, (2019). TRI on-site and off-site reported disposed of or otherwise released (in pounds), for all industries.	96
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11182965	Vinyl Institute, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.	99
11927540	Vinyl Institute, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.	100
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.	101
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6414932	OECD, (2015). Emission scenario document (ESD) on industrial use of industrial cleaners.	107
6558581	OECD, (2009). Emission scenario documents on pulp, paper and board industry.	108
6558582	OECD, (2004). Emission scenario document on water treatment chemicals.	109
10480466	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).	110
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6406226	U.S. EPA, (1982). An exposure and risk assessment for trichloroethanes.	113
7311175	U.S. EPA, (2000). Generic scenario on lube oil additives.	114
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5478191	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.	118
664390	ATSDR, (1989). Toxicological profile for 1,1,2-trichloroethane.	119
5475844	Boegel, J. V. (1989). Air stripping and steam stripping. :6.107-6.118.	120
664488	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	121
664396	Compaan, H. (1988). Waste incineration at sea. :257-274.	122
6311590	Ecology and Environment, (1992). Site investigation and evaluation of remedial measures report Howard Hughes properties plant site, Los Angeles, California.	123
7349020	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.	124
201838	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.	125
87136	Middleton, P., Sockwell, R., Carter, L., W.P. (1990). Aggregation and analysis of volatile organic compound emissions for regional modeling. Atmospheric Environment, Part A: General Topics 24(5):1107-1133.	127
5705544	Miller, C., Srivastava, R. K., Ryan, J. V. (1994). Emissions of organic hazardous air pollutants from the combustion of pulverized coal in a small-scale combustor. Environmental Science & Technology 28(6):1150.	128
7681897	NCBI, (2020). PubChem Compound Summary for CID 6574, 1,1,2-Trichloroethane.	129
1441911	Oil,, Shell (1982). Tertiary water treatment I. A preliminary assessment of active carbon sorption.	130
5441866	Randel, S. (1989). Nine plants enter an environmental world. Chemical Business 11(9):27-29.	131
6108171	Rosenfeld, P. E., Feng, H., L.G. (2011). The petroleum industry. :57-71.	132
13246147	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.	133

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5185306	OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.	138
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7311175	U.S. EPA, (2000). Generic scenario on lube oil additives.	150
11182965	Vinyl Institute, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.	154
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5478191	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.	156
664390	ATSDR, (1989). Toxicological profile for 1,1,2-trichloroethane.	157
4332198	Belpoggi, F., Chiozzotto, D., Lauriola, M. (2012). Unsaturated halogenated hydrocarbons. :129-229.	158
13246145	Santa Cruz Biotechnology, (2019). Safety Data Sheet (SDS): 1,1,2-Trichloroethane.	159
832709	Chiang, H. L., Lin, W. H., Lai, J. S., Wang, W. C. (2010). Inhalation risk assessment of exposure to the selected volatile organic compounds (VOCs) emitted from the facilities of a steel plant. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 45(11):1397-1405.	160
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4293766	Dreher, E. L., Beutel, K. K., Myers, J. D., Lübke, T., Krieger, S., Pottenger, L. H. (2014). Chloroethanes and chloroethylenes. :1-81.	163
7349020	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.	164
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11138808	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.	177
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13246147	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.	180
13246148	U.S. EPA, (2020). National Emissions Inventory (NEI): 1,1,2-Trichloroethane, reporting years 2017 and 2020.	181
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46492	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.	183
7306159	U.S. EPA, (1990). Final best demonstrated available technology (BDAT) background document addendum for F002 (1,1,2-trichloroethane) and F005 (benzene, 2-ethoxyethanol and 2-nitropropane).	184
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11927540	Vinyl Institute, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.	189

Study Citation:	Burlington Indus Inc, (1982). Solvent exposure monitoring Durham Plant, August 21, 1980 with cover letter.		
HERO ID:	3118882		
Conditions of Use:	Adhesives and sealants		
EXTRACTION			
Parameter	Data		
Worker activity description:	Roving frame cleaning; dry frame cleaning		
Exposure route:	Inhalation		
Physical form:	Vapor		
Personal sampling data:	282 - 369 (ppm) (Pg. 5)		
Exposure duration:	45 minutes to 4 hours per day		
Number of workers:	1 (2 samples)		
Comments:	Samples: 2		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
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 are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	Report is more than 20 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple job types tested but uncertainty is not addressed.
Overall Quality Determination		High	

Study Citation:	Carbide,, Union (1988). Feasibility study on six chemicals with attachments and cover letter dated 081588.			
HERO ID:	1332988			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Area sampling data:	possum road (center) - 0.02 (ppm) (Pg. 25) southeast - 1.5 (ppm) (Pg.27)			
Comments:	Number of samples: 2. Sampling location: Possum road landfill (center); Possum road landfill (southeast)			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
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	Monitoring data are greater than 20 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	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			Medium	

Study Citation:	Chiang, H. L., Lin, W. H., Lai, J. S., Wang, W. C. (2010). Inhalation risk assessment of exposure to the selected volatile organic compounds (VOCs) emitted from the facilities of a steel plant. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 45(11):1397-1405.			
HERO ID:	832709			
Conditions of Use:	Steel Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Sintering, cokemaking, hot forming, cold forming			
Area sampling data:	ND - 0.1 (ppb) (Pg. 5)			
Exposure duration:	168 samples. Duration: 8 hr/day			
Personal protective equipment:	Activated carbon mask			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	Uninformative	Data are for steel manufacturing, which is not similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2010]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, percentiles) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type and exposure type provided but missing number of sites and number of workers.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by analyzing different processes but uncertainty is not addressed.
Overall Quality Determination		Uninformative		

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 in commercial environments			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	0.6 to 0.7 ug/m3; mean 0.7 ug/m3 in indoor commercial environments (p. 82)			
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	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	Medium	The data are for commercial environment which is included in the the scope of the risk evaluation but does not mention the specific condition of use.
	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]
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, (1983). 1982 industrial hygiene survey environmental operations department.
HERO ID:	1973135
Conditions of Use:	Uncertain (Either MFG or PROC)

EXTRACTION	
Parameter	Data
Worker activity description:	truck washing, tank truck unloading, drum washing (pg 2); coreboring crew, vacuum truck drivers, control operator (pg 4)
Exposure route:	inhalation
Physical form:	Vapor
Personal sampling data:	load & haul RCI's; wash truck, load and haul water; load and haul water: pg 10 presents: "Estimated 8-hour TWA exposure % of allowable for mixture"; unclear what the "allowable" value is that these % correspond to, or what chemicals are part of the mixture. Same data is presented for vacuuming sump and washing truck on pg 13No personal sampling data for 1,1,2-Trichloroethane.
Area sampling data:	No area sampling data for 1,1,2-Trichloroethane.
Exposure duration:	8-hr workday (pg 5)
Exposure frequency:	40 hour work week (pg 5); vacuuming of sump: once or twice a week (pg 7); vacuuming of raglayer: 4x per week (pg 8); load & haul RCI's: 1 day/week; wash truck, load and haul water: 1 day/week; load and haul water: 3 days/week (pg 10)
Comments:	Number of samples: load & haul RCI's; wash truck, load and haul water; load and haul water: 2 each (pg 10); Vacuuming sump and washing truck (using butterworth): 2 each (pg 13)Measurement types: 8-hr TWA (pg 2); STEL (pg 6)Analytic method: chromatography (pg 4)

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Occupational scenario is unclear, appears to be MFG or PROC. Also unclear whether 1,1,2TCE is included in the "mixture" for which sampling results were provided.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing metadata such as number of workers, PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by conducting sampling on various different dates, but uncertainty is not addressed.

Overall Quality Determination

Medium

Study Citation:	Dow Chemical, (1983). Chemical exposure evaluation: Trichloroethylene production plant (sanitized).			
HERO ID:	4214220			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	pg 9-10			
Exposure route:	Inhalation			
Physical form:	Vapor			
Personal sampling data:	pg 12-31			
Exposure duration:	6 hr sampling time (most samples); 2 samples with 1.1 and 0.6 hrs (pg 16)			
Number of workers:	pg 9-10			
Comments:	Type of measurement: 8-hr TWA; STEL. Analytic method: charcoal tube sampling/GC (pg 3).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
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	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 engineering controls and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

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 and Vinyl Chloride Monomer Production Plant; specific activities for 1,1,2-TCA are unclear (p. 19, 23)
Exposure route:	inhalation
Personal sampling data:	Chlorinated Ethane Products area - Eight-hour time-weighted average exposures for 1,1,2-trichloroethane were ""well below the recommended exposure guidelines"" (p. 19). Vinyl Chloride Monomer Production plant - Eight-hour time-weighted average exposures... were less than 5% of the Industrial Hygiene Guides (p. 23)
Personal protective equipment:	Vinyl Chloride Monomer Production Plant - New sampling systems have been implemented in the loading and direct chlorination areas to reduce exposures. Employees wear full face airline respirators whenever there is a significant potential for exposure. (p. 23)

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
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Study Citation:	Harkov, R., Gianti, S. J., Bozzelli, J. W., Laregina, J. E. (1985). Monitoring volatile organic compounds at hazardous and sanitary landfills in New Jersey. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 20(5):491-502.			
HERO ID:	5245498			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	Vapor			
Area sampling data:	PDF page 7 has arithmetic mean area sampling data for 6 abandoned haz waste sites and one sanitary landfill in NJ, and reports the max concentration across all sites. Pg 8 has ambient monitoring data for Newark, NJ			
Comments:	pg 6 for No. duplicates for area sampling at sites. 26 samples for ambient monitoring. 72 hour samples			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
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	Monitoring 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	Sample type and exposure type provided but missing most other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling at multiple sites, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Mo, Z., Shao, M.,in, Lu, S., Qu, H., Zhou, M., Sun, J.,in, Gou, B.,in (2015). Process-specific emission characteristics of volatile organic compounds (VOCs) from petrochemical facilities in the Yangtze River Delta, China. Science of the Total Environment 533:422-431.			
HERO ID:	3075174			
Conditions of Use:	Petrochemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	total VOC concentrations ranged from 32-2,794 ug/m3			
Comments:	Measurement type: 3.2-L fused silica stainless steel canisters. Analytic method: U.S. EPA methods TO-14 and TO-15.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved EPA method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	Medium	Data are for general petrochemical ambient air, which is similar to the in-scope occupational scenario plastic and rubber products.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics. [Samples were individually taken at different areas in the plants (1 value reported per area)]
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 different plant locations, but uncertainty is not addressed. [Variability in different plant locations, but not for specific process areas or at different sites]
Overall Quality Determination		Medium		

Study Citation:	Namiesnik, J., Zygmunt, B., Kozdron-Zabiegala, B. (1994). Some aspects of indoor air pollution and analysis. Polish Journal of Environmental Studies 3(4):5-19.			
HERO ID:	6021395			
Conditions of Use:	Indoor Sites (Unclear COU)			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	48.9 (ppb) [for trichloroethane]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Poland, an OECD country.
	Metric 3:	Applicability	Low	Data are for an unknown scenario and it is unknown if it applies to 1,1,2-TCA.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no 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:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,1,2-trichloroethane (CASRN 79-00-5).			
HERO ID:	12810919			
Conditions of Use:	Manufacturing - non-isolated byproduct			
EXTRACTION				
Parameter	Data			
Worker activity description:	Section 2.1 describes worker activities.			
Exposure route:	Inhalation is the described exposure route.			
Personal sampling data:	The report contains 145 full-shift samples and 95 task length samples for the non-isolated byproducts COU. Individual data points are provided in Appendix O.			
Exposure duration:	The report provides information on duration of tasks.			
Exposure frequency:	The report provides information on frequency of tasks.			
Personal protective equipment:	The report provides a general description of PPE and specific information on PPE for monitored employees.			
Engineering control:	The report provides a description of engineering and administrative controls.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	A modified NIOSH method was used.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The monitored facilities are in the US.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The data were collected in the past 4 years.
	Metric 5:	Sample Size	High	Discreet sample data was provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability addressed by monitoring at multiple sites and multiple SEGs; Addressed uncertainty in sampling plan with multiple samples at multiple sites for each SEG, providing discrete samples sufficient to estimate 50th and 95th percentile.
Overall Quality Determination			High	

Study Citation:	Wallace, L. A., Pellizzari, E., Hartwell, T., Rosenzweig, M., Erickson, M., Sparacino, C., Zelon, H. (1984). Personal exposure to volatile organic compounds I Direct measurements in breathing-zone air, drinking water, food, and exhaled breath. Environmental Research 35(1):293-319.			
HERO ID:	21711			
Conditions of Use:	Processing (Chemical product manufacturing, petrochemical manufacturing)			
EXTRACTION				
Parameter	Data			
Worker activity description:	Chemical and oil company workers, sewage treatment plant operator, workers not occupationally exposed			
Exposure route:	Inhalation			
Personal sampling data:	New Jersey subjects (4 out of 9 subjects not occupationally exposed) - Median: 0.35 (ug/m^3), Range: 0.14-34.70 (ug/m^3) (Pg. 11)North Carolina subjects (all not occupationally exposed) - Range: 0.14-0.94 (ug/m^3) (Pg. 13)			
Number of workers:	9 people, 161 samples (New Jersey) - 4 not occupationally exposed3 people, 60 samples (North Carolina) - all not occupationally exposed			
Comments:	analytic method: Tenax-GC			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	The monitoring data range includes workers in chemical product manufacturing & petrochemical manufacturing which are in scope but also includes workers who are occupationally not exposed.
	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	Medium	Sample type and exposure type provided but missing exposure duration, exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple job types and locations being tested but uncertainty is not addressed.
Overall Quality Determination		Medium		

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:	Distribution in commerce			
EXTRACTION				
Parameter	Data			
Worker activity description:	Source: interior of vehicles			
Exposure route:	Inhalation			
Area sampling data:	ND to 45.76 ug/m3, ND (median; MDL = 0.071 ug/m3), 1.99 ug/m3 mean (p. 14792 journal, page 4 of 10 document)			
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	Medium	Data are for vehicle interiors, which is similar to the in-scope occupational scenario distribution in commerce [Vehicle interiors - mainly private cars - potentially applicable for Distribution in Commerce]
	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		High		

Study Citation:	Fiserova-Bergerova, V., Pierce, J. T., Droz, P. O. (1990). Dermal absorption potential of industrial chemicals: Criteria for skin notation. American Journal of Industrial Medicine 17(5):617-635.				
HERO ID:	32206				
Conditions of Use:	All				
EXTRACTION					
Parameter	Data				
Worker activity description:	"Industrial setting", "light physical work", "exposures of 2% of the body surface area (equivalent to stretched palms and fingers) to a saturated aqueous solution of the chemical"; pg 4-5				
Exposure route:	Dermal				
Physical form:	saturated aqueous solution				
Dermal exposure data:	calculated fluxes in tables on pg 7-10 (multiple solvents)				
Comments:	"two parallel pathway model"; calculated fluxes in tables on pg 7-10 (multiple solvents)				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods; however, choice of equations and parameters are [not described/not appropriate for application].	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.	
	Metric 3:	Applicability	High	Model can be applied to multiple occupational exposure scenarios.	
	Metric 4:	Temporal Representativeness	Low	Model is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
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	Medium	Uncertainty is addressed by uncertainties in modeled parameters. Variability is not addressed.	
Overall Quality Determination			High		

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:	Mathematical representation of post-exposure absorption and evaporation of chemicals in the skin after exposure.			
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:	Commercial use: laboratory

EXTRACTION	
Parameter	Data
Exposure route:	hand/object to mouth (inadvertent ingestion)
Physical form:	liquid and powder
Dermal exposure data:	pg. 2/13: "Overall, direct transfer from the hands to the oral cavity was significantly higher (mean Transfer Efficiencies, TE = 51.6) than indirect transfer from the hands to the oral cavity via the perioral area by licking the lips (mean TE = 11.5)."Pg. 8/13: "Three transfer coefficient (TEs) are reported for indirect transfer: hand-to-perioral, perioral-to-oral, and hand-to-oral. The hand-to-oral TE describes the overall indirect transfer from the hand to the oral cavity. Liquids transferred from the perioral to the oral areamore readily than solids (mean TE liquids = 100.0%, solids = 71.2%; p = 0.029). But from the hands to the oral area there were no significant differences between transfer for solids and liquids for both direct and indirect transfer."For Solid:Hand-to-oral direct transfer mean TE%: 56.6Hand-to-perioral mean TE%: 17.4Perioral-to-oral mean TE%: 71.2Hand-to-oral (via perioral) mean TE%: 13.2Bare hands direct transfer hand to oral mean TE%: 69.7Bare hands indirect transfer hand-to-perioral mean TE%: 17.6Nitrile direct transfer hand to oral mean TE%: 70.0Nitrile indirect transfer hand-to-perioral mean TE%: 12.0 Cotton direct transfer hand to oral mean TE%: 47.7Cotton indirect transfer hand-to-perioral mean TE%: 4.8 For Liquid:Hand-to-oral direct transfer mean TE%: 36.8Hand-to-perioral mean TE%: 6.5Perioral-to-oral mean TE%: 100Hand-to-oral (via perioral) mean TE%: 6.5Bare hands direct transfer hand to oral mean TE%: 36.8Bare hands indirect transfer hand-to-perioral mean TE%: 6.5Nitrile direct transfer hand to oral mean TE%: 41.4Nitrile indirect transfer hand-to-perioral mean TE%: 8.9Cotton direct transfer hand to oral mean TE%: 31.0Cotton indirect transfer hand-to-perioral mean TE%: 5.9 For soluble powder:Hand-to-oral direct transfer mean TE%: 69.7Hand-to-perioral mean TE%: 17.6Perioral-to-oral mean TE%: 96.4Hand-to-oral (via perioral) mean TE%: 17.0For insoluble powder:Hand-to-oral direct transfer mean TE%: 50.0Hand-to-perioral mean TE%: 17.3Perioral-to-oral mean TE%: 58.6Hand-to-oral (via perioral) mean TE%: 11.3For fine MC:Hand-to-oral direct transfer mean TE%: 39.0Hand-to-perioral mean TE%: 17.8Perioral-to-oral mean TE%: 57.8Hand-to-oral (via perioral) mean TE%: 10.6For rough MC:Hand-to-oral direct transfer mean TE%: 61.0Hand-to-perioral mean TE%: 16.8Perioral-to-oral mean TE%: 59.4Hand-to-oral (via perioral) mean TE%: 12.0All of the TEs from contaminated hands to the perioral area while putting a respirator on and taking it off were below 0.5%. Two of the four transfer TEs from contaminated respirators to the perioral area were below <0.5% and the range of TEs was <0.5%–3.1%. Because the results from experiments with olive oil were considered unreliable only one scenario was assessed: transfer of calcium acetate from the pen to the oral cavity. There was therefore no scope for statistical comparison of groups. The TEs measured ranged from <0.8 to 117.7%, showing potential for a very wide range of TEs.Transfer When Wiping the Perioral Area with the Arm or a Cotton SleeveFor Vinegar: Bare Arms Arm-to-Perioral mean TE%: 13.1Cotton Sleeve Arm-to-Perioral mean TE%: 1.0For Calcium Acetate: Bare Arms Arm-to-Perioral mean TE%: 26.8Cotton Sleeve Arm-to-Perioral mean TE%: 5.0 pg. 2/13: Observational studies of adults have shown average hand-to-mouth contact frequencies of 2–5 contacts per hour
Exposure frequency:	
Comments:	This data source contains laboratory measurements of the transfer efficiency associated with exposure resulting from inadvertent ingestion because of hand/object -to-mouth transfer. The reported transfer efficiencies pertain to surrogate chemicals. An equation is given for calculating exposure resulting from inadvertent ingestion from these transfer efficiencies. 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		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			

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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:	Commercial use: laboratory			
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 2:	Geographic Scope	N/A	The geographic attribute is not relevant in the case of a mathematical model and data obtain 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, (1991). Occupational health summary report - Unit I (vinyl chloride production) with cover sheets and letter dated 062091 (sanitized).			
HERO ID:	5447147			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Loading technician, process technician			
Exposure route:	Inhalation			
Area sampling data:	Exposures were < 5% of the Industrial Hygiene Guide value.			
Personal protective equipment:	Full-face airline respirator			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment 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 as a reactant, 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	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		Medium		

Study Citation:	NIOSH, (1985). Health hazard evaluation report no. HETA-84-214-1633, Sheldahl, Inc., Northfield, Minnesota.. NIOSH(HETA-84-214-1633):84-214.			
HERO ID:	3974905			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Number of workers:	650			
Personal protective equipment:	Safety glasses; respirators (for some job tasks)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment 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 adhesives and sealants, 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	N/A	no sampling 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2009). Emission scenario document on adhesive formulation.
HERO ID:	3827299
Conditions of Use:	Adhesives and sealants

EXTRACTION	
Parameter	Data
Worker activity description:	Unloading, container cleaning, mixing operations, sampling, equipment cleaning, packaging
Exposure route:	Dermal and inhalation
Area sampling data:	Dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids
Number of workers:	22 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 ESD was developed by EPA 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	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 various chemical functions and types of adhesives.

Overall Quality Determination	High
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Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.		
HERO ID:	3827300		
Conditions of Use:	Adhesives and sealants		
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	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 various chemical functions, types of adhesives, and end use markets.
Overall Quality Determination		High	

Study Citation:	OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.		
HERO ID:	5185306		
Conditions of Use:	Processing as an intermediate		
EXTRACTION			
Parameter	Data		
Worker activity description:	Tank filling; sampling; analysis; maintenance		
Exposure route:	Inhalation		
Area sampling data:	Tank filling: 2.7 (mg/m^3) (Pg. 48) Sampling: 9.8 (mg/m^3) Analysis: 4.4 (mg/m^3) Maintenance: 9.3 (mg/m^3) p.273/274 of the document		
Exposure duration:	”Tank filling: 0.5 hours/day (Pg. 48) Sampling: 2 min/time Analysis: 10 min/time Maintenance: 15 min/time”		
Exposure frequency:	”Tank filling: 330 days/year (Pg. 48) Sampling: 12 times/day Analysis: 12 times/day Maintenance: once/month”		
Comments:	Tank filling: 0.5 hours/day (Pg. 48)Sampling: 2 min/timeAnalysis: 10 min/timeMaintenance: 15 min/timeTank filling: 330 days/year (Pg. 48)Sampling: 12 times/dayAnalysis: 12 times/dayMaintenance: once/month		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	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	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	Medium	Variability addressed by sampling multiple job activities but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Processing: Petrochemical Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading, container cleaning, equipment/storage tank cleaning			
Exposure route:	Dermal			
Dermal exposure data:	Dermal: Provides methods for modeling exposures to non-volatile liquids.			
Number of workers:	8 workers/site			
Personal protective equipment:	impervious gloves, clothing, safety glasses, masks or respirators			
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	High	The assessment is for an occupational scenario within the scope of 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 on- and off-shore wells and chemical functions.	
Overall Quality Determination		High		

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			
Personal sampling data:	0-12.8 (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	Uninformative	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			Uninformative	

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.
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.
Dermal exposure data:	Dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.
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
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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			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading transport containers, container cleaning, equipment cleaning, loading of transport containers.			
Exposure route:	Dermal, Inhalation			
Area sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Dermal exposure data:	Dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
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 Generic Scenario 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:	Plastic material and resin manufacturing

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: Provides methods for modeling exposures to both solids and non-volatile liquids.
Exposure frequency:	250 days/yr.

		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	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	High
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Study Citation:	U.S. EPA, (1982). An exposure and risk assessment for trichloroethanes.			
HERO ID:	6406226			
Conditions of Use:	Vapor Degreasing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Degreasing operations			
Exposure route:	Dermal and inhalation.			
Physical form:	Liquid			
Area sampling data:	11,000 mg/day/person			
Exposure duration:	0.08-0.02 hours of liquid exposure per day and 8 hours of vapor exposure per day.			
Number of workers:	130,000			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment 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	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated. (1982)
	Metric 5:	Sample Size	Low	Sample distribution is 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	Variability addressed by analyzing both dermal and inhalation exposures, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Processing of the lube oil additives consists of blending the PMN chemical with base stock and other additives to make a lubricant product. (P 27/44)			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquids			
Dermal exposure data:	Dexp = PMN, x 1,800 mg/day			
Exposure frequency:	300 days/yr (P. 28/44)			
Number of workers:	30 workers/site			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation:			
Physical form:	liquids			
Dermal exposure data:	D _{der} , = C x 1,800 mg/day			
Exposure frequency:	20 days/yr			
Number of workers:	45 workers/site			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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 a frequently used source
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Industrial use			
EXTRACTION				
Parameter	Data			
Worker activity description:	Maintenance workers drain oil from machinery and add fresh oil.			
Exposure route:	DermalInhalation: Negligible			
Physical form:	liquid			
Dermal exposure data:	Amount of dermal exposureDexp = PMN, x 8,700 mg/day			
Exposure frequency:	250 days/yr			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Consumer use, DIY			
EXTRACTION				
Parameter	Data			
Worker activity description:	Consumer drains oil from automobile and adds fresh oil containing 1 % PMN to automobile crankcase. The used oil is collected and recycled.			
Exposure route:	DermalInhalation: Negligible			
Physical form:	liquid			
Dermal exposure data:	Amount of dermal exposureDexp = PMNc x 1,800 mg/day			
Exposure frequency:	8 days/yr			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		High		

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: 6.1 (ug/m ³); Epoxy primer: 1.0 (ug/m ³); Acrylic topcoat: 5.1 *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
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Study Citation:	ATSDR, (1989). Toxicological profile for 1,1,2-trichloroethane.			
HERO ID:	664390			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Number of workers:	1,036 (Pg. 74)			
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	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:	Santa Cruz Biotechnology, (2019). Safety Data Sheet (SDS): 1,1,2-				
HERO ID:	Trichloroethane. 13246145				
Conditions of Use:	Use of laboratory chemicals				
EXTRACTION					
Parameter	Data				
Physical form:	Liquid				
EVALUATION					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.	
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	High	Source is from 2019, which is less than 10 years old.	
	Metric 5:	Sample Size	N/A	N/A - Physical Form.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how it was obtained.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical Form.	
Overall Quality Determination			High		

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	High	Data are for various in-scope occupational scenarios.
	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	exposure route info
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	exposure route info
Overall Quality Determination			High	

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			
Worker activity description:	N/A; correlation between experimental exposure and dermal uptake			
Exposure route:	inhalation; dermal			
Physical form:	vapor; liquid			
Exposure duration:	30 minute			
Comments:	correlations on pg 6 and 10 (graphs); not real exposure data but correlation between experimental exposures and uptake			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality methods that are 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		Medium		

Study Citation:	Dow Chemical, (1988). Mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant with cover letter dated 050389.			
HERO ID:	1441931			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Worker activity description:	Potential exposure to the feedstock, process chemicals, finished products and wastes have not been unique to any particular job classification. Anecdotal information indicated that before waste products were disposed of via a dosed tank, they were stored in open dumpsters, which resulted in potential for airborne exposure. This practice of waste disposal of the heavy chlorinated organics was discontinued in the late 1960's. At that time a dosed holding tank was built to store by-products that were then pumped through a closed system to a tank to be shipped to a thermal oxidizer.			
Exposure route:	Inhalation			
Physical form:	Vapor			
Exposure duration:	Mean years of experience in the plant was 4.3 years			
Number of workers:	270 white males (1944-1982)			
Comments:	The article is a study of mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report appears to use high quality techniques/sound methods and was submitted to EPA by a company.
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 - no sample data
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	No scope to address variability and uncertainty.
Overall Quality Determination		High		

Study Citation:	Dow Chemical, (1991). Letter to USEPA regarding enclosed document concerning the complete review of a medical surveillance and related data concern- ing Dow Chemical Company employees.			
HERO ID:	664480			
Conditions of Use:	Uncertain			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Number of workers:	13 employees at plant (pg 3)			
Personal protective equipment:	respirators			
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	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Occupational scenarios for the plant in question are not specified, only chemicals han- dled.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are ex- pected to be outdated.
	Metric 5:	Sample Size	N/A	number of workers/PPE info
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Methods, results, and assumptions are clearly documented, but lacks information on the chemical activities
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	number of workers/PPE info
Overall Quality Determination		Low		

Study Citation:	Lewis, R. J., Sr (2012). 1,1,2-Trichloroethane 79-00-5. :1-5.			
HERO ID:	7306151			
Conditions of Use:	All conditions of use			
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	Data are for all in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old. [2012]
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or 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	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 6574, 1,1,2-Trichloroethane.			
HERO ID:	7681897			
Conditions of Use:	Applies to more than 1 COU			
EXTRACTION				
Parameter	Data			
Worker activity description:	Occupational exposure to 1,1,2-trichloroethane may occur through inhalation and dermal contact with this compound at workplaces where 1,1,2-trichloroethane is produced or used.			
Exposure route:	Dermal and inhalation			
Physical form:	Liquid			
Number of workers:	NIOSH (NOES Survey 1981-1983) has statistically estimated that 1038 workers (16 of these were female) were potentiallyexposed to 1,1,2-trichloroethane in the US(1).			
Personal protective equipment:	Protective clothing			
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 scenario.
	Metric 4:	Temporal Representativeness	Medium	Referenced article for most information is from 2008.
	Metric 5:	Sample Size	N/A	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	N/A - No scope to address variability and uncertainty.
Overall Quality Determination		High		

Study Citation:	NICNAS, (2013). IMAP single assessment report: Ethane, 1,1,2-trichloro-: Human health tier II assessment.			
HERO ID:	6305761			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	During product formulation, dermal and inhalation exposure of workers to the chemical may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. Worker exposure to the chemical at lower concentrations may also occur during use of formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.			
Exposure route:	Dermal and inhalation.			
Physical form:	Transparent colourless liquid, with a sweet chloroform-like odour.			
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 processing as a reactant, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2013]
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	NIOSH, (2007). NIOSH pocket guide to chemical hazards.			
HERO ID:	192177			
Conditions of Use:	Commercial Use: general			
EXTRACTION				
Parameter	Data			
Exposure route:	Toxicologically important entry routs (i.e., not potential routes associated with an exposure scenario): Inhalation, absorption, ingestion, contact. (pdf 345/454)			
Physical form:	Colorless liquid with a sweet, chloroform like odor. (Pdf 345/454) This is not the physical form in the case of an occupational exposure scenario of the risk evaluation.			
Personal protective equipment:	Various respirator types recommendation provided. (pdf 345/454 and Table 3 and 4 for description) These are not respirators that are known to be used in a COU of the RE.			
Comments:	Synonyms/Trade Names: Ethane trichloride, beta-Trichloroethane, Vinyl trichlorideNIOSH REL: TWA 10 ppm (45 mg/m3) OSHA PEL: TWA 10 ppm (45 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. NIOSH report.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	N/A	The data source does not contain data that pertain to an occupational exposure scenario 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	This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	This metric is not applicable to the data being extracted
Overall Quality Determination		High		

Study Citation:	NIOSH, (2019). NIOSH pocket guide to chemical hazards: 1,1,2-Trichloroethane.			
HERO ID:	5353121			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation and skin absorption, ingestion, skin and/or eye contact			
Physical form:	Colorless liquid.			
Personal protective equipment:	At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:APF = 10,000: Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.APF = 10,000: Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or otherpositive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.Escape:APF = 50: Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vaporcanister.Any appropriate escape-type, self-contained breathing apparatus.			
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 conditions of use.
	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 - Physical form, exposure route, and PPE.
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 - Physical form, exposure route, and PPE.
Overall Quality Determination		High		

Study Citation:	NIOSH, (1981). Permeation of protective garment materials by liquid halogenated ethanes and a polychlorinated biphenyl.			
HERO ID:	5476924			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Personal protective equipment:	Permeability study for different types of gloves on PDF Pg. 22.			
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 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	Medium	Multiple different PPE materials given
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	High	Uncertainty is addressed by multiple testing iterations. Variability addressed by multiple PPE types tested.
Overall Quality Determination			High	

Study Citation:	NIOSH, (1983). In-depth industrial hygiene survey report of the arrow shirt company Atlanta, Georgia no: 125.12 (36). 14:B2-14.		
HERO ID:	5908875		
Conditions of Use:	Dry cleaning agent		
EXTRACTION			
Parameter	Data		
Exposure route:	inhalation		
Personal sampling data:	non-detect		
Area sampling data:	non-detect		
Comments:	Area sampling location: outside of ventilation hood. Analytic method: MDA Accuhaler Model 808R sampling pumps calibrated to 100 cc/min in conjunction with charcoal tubes. Analyzed by NIOSH P&CAM 127.		
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	Uninformative	Data are for use as a dry cleaning agent which is not in-scope or similar to 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 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 taking both area and personal breathing zone samples but uncertainty is not addressed.
Overall Quality Determination		Uninformative	

Study Citation:	NIOSH, (1978). Current intelligence bulletin 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:	112,000 workers			
Personal protective equipment:	May include respirators, goggles, gloves, etc.			
Engineering control:	Enclosure of the operation and/or 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 general and applicable 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	No sample data.	
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	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	NIOSH, (1976). Occupational health guideline for 1,1,2-trichloroethane.			
HERO ID:	8407245			
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, face shields (8 inch minimum), and other protective clothing necessary to prevent repeated or prolonged skin contact with liquid 1,1,2-trichloroethane. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed or when they fail and need to be supplemented.			
Engineering control:	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 general and applicable 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 - No sample data.	
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	N/A - No scope to address variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	NIOSH, (1994). Table of Immediately Dangerous to Life or Health Concentrations (IDLH): 1,1,2-Trichloroethane.			
HERO ID:	8673774			
Conditions of Use:	May apply to more than 1 COU			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal and inhalation			
Physical form:	Liquid			
Personal protective equipment:	NIOSH recommends as part of its carcinogen policy that the "most protective" respirators be worn for 1,1,2-trichloroethane at concentrations above 10 ppm.			
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 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. (1994)
	Metric 5:	Sample Size	N/A	N/A - physical form, exposure route, and PPE.
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 - physical form, exposure route, and PPE.
Overall Quality Determination			High	

Study Citation:	NLM, (2020). Hazardous agents: 1,1,2-Trichloroethane.			
HERO ID:	10143330			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Worker activity description:	Industrial Processes with risk of exposure:Painting (Solvents); Plastic Composites Manufacturing; Working with Glues and Adhesives			
Exposure route:	Inhalation, Dermal			
Physical form:	Colorless liquid.			
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 conditions of use.
	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 - physical form, 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 - physical form., worker activity desc., and exposure route
Overall Quality Determination			High	

Study Citation:	Parker, J. C., Casey, G. E., Bahlman, L. J., Leidel, N. A., Rose, D., Stein, H. P., Thomas, A. W., Lane, J. M. (1979). Chloroethanes: Review of toxicity. American Industrial Hygiene Association Journal 40(3):A46-A60.			
HERO ID:	63098			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, skin absorption, and ingestion			
Number of workers:	112,000 estimated number of workers exposed (Table II)			
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 is for all conditions of use.
	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	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
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:	All			
EXTRACTION				
Parameter	Data			
Number of workers: Used to develop a method to estimate number of sites and workers.				
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	BLS is expected to use reliable survey methods.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	U.S. based economic data.	
	Metric 3: Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.	
	Metric 4: Temporal Representativeness	High	The BLS OES data are from 2021.	
	Metric 5: Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Manufacture and Import			
EXTRACTION				
Parameter	Data			
Physical form:	Provides physical form.			
Number of workers:	Provides estimate of number of workers.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	CDR is U.S. based data.
	Metric 3:	Applicability	High	CDR covers chemical manufacturers and importers, which are in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2020 CDR.
	Metric 5:	Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

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:	This document provides updates to the parameters used for dermal exposure estimates. Updated parameters are listed below: Routine, direct handling of solids with 2 hands Resulting dermal contact: up to 3,100 mg Routine contact with surfaces, 2 hands, solids Resulting dermal contact: up to 1,100 mg Routine immersion, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 1.3-10.3 mg/cm^2 Resulting dermal contact: up to 11,000 mg Routine contact, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 2,200 mg Incidental contact, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 2,200 mg Incidental contact, 1 hand, liquids Surface area: 535 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 1,100 mg			
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:	U.S. EPA, (2011). Provisional Peer-Reviewed Toxicity Values for 1,1,2-trichloroethane (CASRN 79-00-5).			
HERO ID:	1257697			
Conditions of Use:	May apply to more than 1 COU			
EXTRACTION				
Parameter	Data			
Physical form:	Inhalation, oral			
Comments:	Source tagged for production, import, or use volumes; however, this data was not found in the source.			
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 scenario.
	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 - 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 - exposure route
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2026). Chemical Data Reporting (CDR): Reporting year 2024.			
HERO ID:	13246149			
Conditions of Use:	Manufacture and Processing as a reactant,			
EXTRACTION				
Parameter	Data			
Physical form:	Provides physical form for multiple OES.			
Number of workers:	Provides number of workers for multiple OES.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	CDR is U.S. based data.
	Metric 3:	Applicability	High	CDR covers multiple OES, which are in scope for the chemical.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2024 CDR.
	Metric 5:	Sample Size	Medium	Number of workers is presented as a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1995). National primary drinking water regulations: 1,1,2-Trichloroethane.			
HERO ID:	7307015			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation and consumption.			
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	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data that 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	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:	Arthur D. Little Inc, (1987). Evaluation of chemical air emissions from the Bristol plant production facilities, Rohm and Haas, Delaware Valley, Inc (final report) with attachments and cover letter dated 08/10/1989.			
HERO ID:	1481094			
Conditions of Use:	Domestic Manufacture			
EXTRACTION				
Parameter	Data			
Release or emission factors:	water; Non-detect (Pg. 122)			
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 manufacture, an in-scope occupational scenario.
	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	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by QC of samples and multiple samples being taken. Variability is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Atasoy, E., Döğeroğlu, T., Kara, S. (2004). The estimation of NMVOC emissions from an urban-scale wastewater treatment plant. Water Research 38(14-15):3265-3274.			
HERO ID:	3572863			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	VOC emissions from WWTPs may occur mainly through the following mechanisms: * diffusive volatilization (driven by the concentration differences between the air and the contacting aqueous phase), * convective stripping (via agitation, forced-air flow, etc.), * evaporation (driven by the temperature difference between the air and the aqueous phase). (p. 3)			
Release quantity:	calculated emissions for each process unit calculated on p. 8. 140E-05 t/yr total emissions for this chem. Table 3			
Comments:	Release estimation method: AP-42 (Part 4.3) (p. 5)Wastewater VOC inlet concentrations (mgL-1) is provided in Table 2. That is 0.8 micrograms/L			
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. [Typically used AP-42 emission factors to estimate emissions from various process units - may not cover all release sources at site]	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Turkey, an OECD country.	
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario. [Wastewater Treatment]	
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old. [Published 2004]	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [only single values for each process unit]	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency (per year) provided but missing other metadata. [Provides estimates by process unit]	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed. [No variability/uncertainty - only looked at one plant in Turkey]	
Overall Quality Determination		Medium		

Study Citation:	Cowfer, J. A., Gorenssek, M. B. (2006). Vinyl chloride. :1-31.
HERO ID:	6301240
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
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Description of release source:	Byproduct of EDC production disposal.
Waste treatment methods and pollution control:	Gaseous vent streams from the different unit operations may contain traces (or more) of HCl, CO, methane, ethylene, chlorine, and vinyl chloride. These can sometimes be treated chemically, or a specific chemical value can be recovered by scrubbing, sorption, or other method when economically justified. For objectionable components in the vent streams, however, the common treatment method is either incineration or catalytic combustion, followed by removal of HCl from the effluent gas.

EVALUATION

Domain	Metric	Rating	Comments
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Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
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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	Medium	Data are greater than 10 years old but less than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.

Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
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Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
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Overall Quality Determination**Medium**

Study Citation:	Dempsey, C. R. (1993). A comparison of organic emissions from hazardous waste incinerators versus the 1990 toxics release inventory air releases. Journal of the Air and Waste Management Association 43(10):1374-1379.			
HERO ID:	659922			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Hazardous Waste Incinerators			
Release quantity:	See Table 1, pg. 3			
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	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 (95th percentile given) 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 release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by comparing the study results to TRI results, but uncertainty is not addressed.
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:	Greater Houston, TX Area [PDF Pg. 16]Releases: 17,645 lbsWaste Transfers Sent Off-Site: 29,244,936 lbsWaste Received: 30,793,503 lbsPort Arthur, TX and Surrounding Area [PDF Pg. 19]Releases: 692 lbsWaste Transfers Sent Off-Site: 5,933 lbsWaste Received: 2,227,498 lbsMossville, LA Area [PDF Pg. 22]Releases: 50,752 lbsWaste Transfers Set Off-Site: 243,343 lbsCommunities in Cancer Alley, LA [PDF Pg. 24]Releases: 73,095 lbsWaste Transfers Sent Off-site: 8,688,021 lbsVeolia (Port Arthur, TX) [PDF Pg. 45]Air: 692 lbsIncoming Waste Transfers: 2,227,498 lbsOffsite Transfer: 5,933 lbsOxy Vinyls LP La Porte VCM Plant (LaPorte, TX) [PDF Pg. 59]Air: 1,849 lbsOffsite Transfer: 19,637,534 lbsOlin Blue Cube (Freeport, TX) [PDF Pg. 59]Air: 9,212 lbsWater: 10 lbsLand: 7 lbsOffsite Transfer: 6,836,765 lbsFormosa (Point Comfort, TX) [PDF Pg. 59]Air: 735 lbsOffsite Transfer: 2,609,927 lbsDow Chemical (Freeport, TX) [PDF Pg. 59]Air: 4,829 lbsWater: 27 lbsLand: 77 lbsIncoming Waste Transfers: 6,649,139 lbsOffsite Transfer: 82,974 lbsOxy Vinyls LP Deer Park - VCM Plant (Occidental Chemical) (Deer Park, TX) [PDF Pg. 59]Air: 776 lbsIncoming Waste Transfers: 16,815,411 lbsOffsite Transfer: 53,738 lbsAscend Performance Materials - Chocolate Bayou Plant (Alvin, TX) [PDF Pg. 59]Air: 0.5 lbsOffsite Transfer: 3 lbsClean Harbors (LaPorte, TX) [PDF Pg. 59]Air: 123 lbsIncoming Waste Transfers: 7,328,953 lbsOffsite Transfer: 23,995 lbsWestlake Chemical (Westlake, LA) [PDF Pg. 76]Air: 49,381 lbsWater: 100 lbsOffsite Transfer: 216,395 lbsWestlake Charles North (Westlake, LA) [PDF Pg. 76]Air: 1,271 lbsOffsite Transfer: 26,948 lbsFormosa (Baton Rouge, LA) [PDF Pg. 89]Air: 11,256 lbsOffsite Transfer: 7,274,231 lbsOccidental Chem. (Convent LA) [PDF Pg. 89]Air: 263 lbsWater: 13.90 lbsLand: 0.08 lbsOffsite Transfer: 813,906 lbsDow Chemical (Plaquemine, LA) [PDF Pg. 89]Air: 2,056 lbsWater: 3 lbsOffsite Transfer: 293,847 lbsOlin Blue Cube (Plaquemine, LA) [PDF Pg. 89]Air: 1,393 lbsOffsite Transfer: 288,641 lbsShintech (Plaquemine, LA) [PDF Pg. 89]Air: 31,527 lbsOccidental Chem. (Geismar, LA) [PDF Pg. 89]Air: 10,898 lbsWater: 6.50 lbsOffsite Transfer: 7,793 lbsWestlake Vinyls Co. (Geismar, LA) [PDF Pg. 89]Air: 13,458 lbsWestlake (formerly Axiall) (Plaquemine, LA) [PDF Pg. 89]Air: 2,221 lbsOffsite Transfer: 9,603 lbs

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.
	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

Continued on next page ...

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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		
		EVALUATION	
Domain	Metric	Rating	Comments

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:	Lists 1,1,2-TCA as a compound analyzed but not detected in the exhaust gas (p. 6). LOD or initial concentration of 1,1,2-TCA in waste stream unknown.
Waste treatment methods and pollution control:	Presents destruction and removal efficiencies for some VOCs. Lists 99.999% DRE for trichloroethane (not specified whether 1,1,1-TCA or 1,1,2-TCA (p. 4).
Comments:	Media: air; Lists 1,1,2-TCA as a compound analyzed but not detected in the exhaust gas (p. 6). LOD or initial concentration of 1,1,2-TCA in waste stream unknown.

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 1,1,2-TCA not detected in waste stream
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Release media provided, but no other metadata provided: LOD, initial amount of 1,1,2-TCA in waste stream
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination

Medium

Study Citation:	Li, R., Xu, A., Zhao, Y., Chang, H., Li, X., Lin, G. (2022). Genetic algorithm (GA) - Artificial neural network (ANN) modeling for the emission rates of toxic volatile organic compounds (VOCs) emitted from landfill working surface. Journal of Environmental Management 305:114433.			
HERO ID:	10164739			
Conditions of Use:	Waste Handling, Treatment and Disposal (Landfills)			
EXTRACTION				
Parameter	Data			
Description of release source:	A large MSW landfill			
Release quantity:	Annual emissions (tons/year) in figure 3.			
Release or emission factors:	Average emission rate: 0.00212 ug x m^-2 x s^-1 (Section S.6 in Supplemental)			
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	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for waste handling (landfills), an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (average, standard deviation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by continuous sampling over a nine-month period. but uncertainty is not addressed.
Overall Quality Determination			High	

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:	Conventional disposal of chlorinated hydrocarbon wastes has been achieved by high temperature incineration. This process produces aqueous HCl, water, and carbon dioxide, and steam is cogenerated. The incineration process has come under scrutiny due to concerns with the production of trace quantities of undesired compounds such as dioxins and furans. As a result, a number of processes for disposal of chlorocarbon wastes have been investigated.

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.
	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	Low	Distribution of samples is qualitative
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata
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:	Middleton, P., Sockwell, R., Carter, L., W.P. (1990). Aggregation and analysis of volatile organic compound emissions for regional modeling. Atmospheric Environment, Part A: General Topics 24(5):1107-1133.			
HERO ID:	87136			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Release quantity:	<1,000 metric tons (Pg. 23)			
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	Uninformative	Condition of use is unknown	
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing release source, release estimation method, number of sites, waste treatment method.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Uninformative		

Study Citation:	Midwest Research Institute, (1984). Performance evaluation of full-scale hazardous waste incinerators - Volume I (excutive summary) contract no. 68-02-3177 (43).			
HERO ID:	1269556			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Haz. Waste Incinerator			
Release or emission factors:	<0.2 ng/L; <0.0002 g/min for Gas Bag sampling, <0.05 ng/L; <0.00004 g/min for VOST sampling (pg 404)			
Waste treatment methods and pollution control:	Incineration; >99.9999% for gas bags, >99.999994 for VOST (pg 387)			
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	Low	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	Release media and release frequency (i.e., influent rates and emission factors) provided, but missing other metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by conducting multiple sampling runs and by using two different sampling methods, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Nagel, C. J., Chanenchuk, C. A., Wong, E. W., Bach, R. D. (1996). Catalytic extraction processing: An elemental recycling technology. Environmental Science & Technology 30(7):2155-2167.			
HERO ID:	660326			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter		Data		
Description of release source:		Catalytic Extraction Processing (CEP)		
Release or emission factors:		7.5 (mg/kg) (Pg. 7)		
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.
	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 release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

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:	Table 23 contains emission factors and release estimation equations for various organic pollutants in end-use products (page 81/109).			
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.,i, 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:	NMVOC emission factors summarized in tables on p. 104-106

		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 variability and uncertainty of EFs which are likely more relevant for risk assessment

Overall Quality Determination	Low
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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:	UV/Oxidation technology - Greater than 90% removal efficiencies were achieved for most volatile organic compounds (VOCs)... (p. 33) More details may be available in referenced source (Lewis, 1990)			
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:	Solvent use			
EXTRACTION				
Parameter	Data			
Description of release source: Evaporation from solvents (Pg. 51)				
Comments: Fugitive emission during use as a solvent and evaporation from wastewater are the mainemission routes to air. Reliable quantitative data are lacking.				
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 solvent use, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or 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:	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:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Trade effluent			
Release or emission factors:	17.9 (ug/L) (Pg. 9)			
Comments:	Please check Table 1 and Table 4.			
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 the United Kingdom, 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) 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (2023). Discharge Monitoring Report (DMR): 1,1,2-Trichloroethane, reporting years 2019-2023.			
HERO ID:	13246146			
Conditions of Use:	Manufacturing as a byproduct, Processing as a reactant, Distribution in commerce, Use of laboratory chemicals, and waste handling, disposal, and treatment			
EXTRACTION				
Parameter	Data			
Description of release source:	DMR provides SIC/NAICS codes related to operations for each facility which may be used to derive release sources for each OES.			
Release quantity:	DMR provides annual release quantities for facilities performing multiple in-scope OES operations.			
Waste treatment methods and pollution control:	POTWs are flagged in the DMR data.			
Comments:	Document was tagged for release frequency but does not provide that information.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is expected to be accurate but does not address what the source of the release is.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	DMR is U.S. based data.
	Metric 3:	Applicability	High	DMR includes data for facilities performing operations under multiple in-scope OES.
	Metric 4:	Temporal Representativeness	High	Data are from 2019-2023.
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	DMR only includes release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	DMR does not address variability or uncertainty in submitter provided data.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.			
HERO ID:	13246147			
Conditions of Use:	Manufacturing as a byproduct at chemical manufacturing facilities, Processing as a reactant, Use of cleaning and degreasing solvents, Disposal to incineration, and Disposal to landfill			
EXTRACTION				
Parameter	Data			
Description of release source:	TRI provides NAICS codes related to operations for each facility which may be used to derive release sources for each OES.			
Release quantity:	TRI provides annual release quantities for facilities performing multiple in-scope OES operations.			
Waste treatment methods and pollution control:	TRI provides TRI use codes which may be used to derive waste handling methods (landfill, POTW, Incineration).			
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	TRI is U.S. based data.
	Metric 3:	Applicability	High	Data is for multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Data is from 2019-2023.
	Metric 5:	Sample Size	Medium	Due to reporting requirements, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	TRI only includes release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	TRI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2020). National Emissions Inventory (NEI): 1,1,2-Trichloroethane, reporting years 2017 and 2020.			
HERO ID:	13246148			
Conditions of Use:	Manufacturing as a byproduct in chemical manufacturing, Manufacturing as a byproduct in pulp and paper industry, Repackaging (Import), Processing as a reactant (Intermediate), Use of cleaning and degreasing solvents, Industrial use of adhesives and sealants, Use of laboratory chemicals, Disposal to incineration, Disposal to landfill, Disposal to POTW, Disposal to non-POTW WWT, Remediation			
EXTRACTION				
Parameter	Data			
Description of release source:	Provides unit/process of release for multiple OES.			
Release quantity:	Provides release data for multiple OES.			
Release or emission factors:	Provides emission factors for multiple OES.			
Release frequency:	Provides annual operating time for multiple OES.			
Waste treatment methods and pollution control:	Provides controls information for multiple OES.			
Comments:	Document was tagged for life cycle description and throughput, however, NEI does not contain this data so these data were not extracted.			
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 data applies to multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	NEI data is from 2017 and 2020.
	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). 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:	Waste solvent reclamation emissions from storage tank vents, condenser vents, emission stacks, spillage, loading, leaks and open sources.			
Release or emission factors:	Storage tank vents: 0.02 lb/tonCondenser vents: 3.30 lb/tonIncinerator stacks: 0.02 lb/tonSpillage: 0.20 lb/tonLoading: 0.72 lb/tonLeaks: nondetectOpen sources: nondetect			
Waste treatment methods and pollution control:	Recycling waste solvent.			
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 recycling, 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) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency (i.e., emission factors) provided, but missing other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by estimating emission factors from multiple sources, but uncertainty is not addressed.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2015). Chapter 5: Petroleum industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.				
HERO ID:	5097885				
Conditions of Use:	Processing as a reactant				
EXTRACTION					
Parameter	Data				
Description of release source:	Valves, pump seals, connectors, open-ended lines, sampling connections.				
Release or emission factors:	Emission factors given in kg/hr/source (light liquid). Valves: 0.00403Pump seals: 0.0199Connectors: 0.00183Open-ended lines: 0.0017Sampling connections: 0.0150				
Comments:	TABLE 2-1. SOCFI AVERAGE EMISSION FACTORS				
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 processing as a reactant, 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. (2015)	
	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 (i.e., emission factors) provided, but missing other metadata.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing emissions from different sources, but uncertainty is not addressed.	
Overall Quality Determination			High		

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 release data per release event.
Release or emission factors:	Provides release data.
Release frequency:	Provides annual operating time.
Waste treatment methods and pollution control:	Provides controls information.

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 2019.
	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, (1990). Final best demonstrated available technology (BDAT) background document addendum for F002 (1,1,2-trichloroethane) and F005 (benzene, 2-ethoxyethanol and 2-nitropropane).			
HERO ID:	7306159			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Testing, cleaning, solvent coating, research, and chemical manufacturing.			
Release quantity:	Release quantities in gal/yrTesting: 165Cleaning: 800Solvent Coating: 3,000 - 68,700Research: 1,000Chemical Manufacturing: 800			
Release or emission factors:	Effluent concentrations: 12.4 ug/L.			
Waste treatment methods and pollution control:	Incineration and wet air oxidation followed by carbon adsorption.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or 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.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics (single estimates provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency (i.e., emission factors) provided, but missing other metadata like activity.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing emissions from different sources, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). National primary drinking water regulations: 1,1,2-Trichloroethane.			
HERO ID:	7307015			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Release quantity:	Gross annual discharge of 1,1,2-TCE is 4 million lbs.			
Comments:	TRI data for land and water from 1987 to 1993 are provided. see page 1.			
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 processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics (single estimates 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			Medium	

Study Citation:	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7315820			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Description of release source:	Drying oven exhaust, fugitive emissions, product retention and subsequent emission			
Release or emission factors:	Uncontrolled emission factors are as follows (in lb/lb):Drying oven exhaust: 0.8-0.95Fugitive emissions: 0.01-0.15Product retention and subsequent emission: 0.01-0.15			
Waste treatment methods and pollution control:	Carbon adsorption (95-95% efficient) and incineration (99% efficient).			
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 adhesives and sealants, an in-scope occupational scenario; however, data are not specific to this chemical.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (range) 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 release amounts.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving multiple emission factors, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Description of release source:		The primary source of emissions from the EDC chlorination process are the waste streams from the HCl scrubber. Waste water streams may contain chlorine, HCl, spent caustic, and various chlorohydrocarbons, including EDC, trichloroethane and reaction byproducts.		
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 processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data that are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or 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	The release data study does not address variability or uncertainty.
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:	Manufacturing and on-site processing fugitive and stack air emissions.
Release quantity:	Total on- and off-site releases are 331,309.88 lbs/year.
Waste treatment methods and pollution control:	On-site energy recovery; recycling.

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 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	Release media and release frequency provided but missing control methods and efficiencies.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving emissions from multiple facilities, but uncertainty is not addressed.

Overall Quality Determination	High
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Study Citation:	U.S. EPA, (2019). TRI on-site and off-site reported disposed of or otherwise released (in pounds), for all industries.			
HERO ID:	8784984			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Release quantity:	Total On-site Disposal or Other Releases: 43,038 lbsTotal Off-site Disposal or Other Releases: 8,441 lbsTotal On- and Off-site Disposal or Other Releases: 51,479 lbs			
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 less 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	Release media and release frequency provided but missing waste treatment methods.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving on- and off-site emissions, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Vaart, V.d., D. R., Vativuk, 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:	In practice, most streams are mixtures of compounds, thereby further complicating the prediction of this temperature. Other studies,4”6 which are based on actual field test data, show that commercial incinerators should generally be run at 1600°F with a nominal residence time of 0.75 seconds to ensure 98 percent destruction of nonhalogenated organics. (p, 3). Doc provides information on thermal and catalytic incineration.			
Comments:	Media: air			
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. (U.S. EPA article)
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 the data are not 1,1,2-TCA specific
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1990s)
	Metric 5:	Sample Size	N/A	N/A - no relevant engineering data
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - no relevant engineering data
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - no relevant engineering data
Overall Quality Determination		Medium		

Study Citation:	Vaart, v.d., D., 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			
Description of release source:	thermal and catalytic incineration			
Waste treatment methods and pollution control:	incinerators can easily achieve destruction efficiency >98% (p, 4). Doc provides information on thermal and catalytic incineration.			
Comments:	Media: air			
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	Medium	Data are for disposal, an in-scope occupational scenario but the data are not 1,1,2-TCA specific
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old (1994)
	Metric 5:	Sample Size	N/A	No quantified/quantifiable (i.e., graph) data provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	No quantified/quantifiable (i.e., graph) data provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No quantified/quantifiable (i.e., graph) data provided
Overall Quality Determination		Medium		

Study Citation:	Vinyl Institute, (2020). Comment submitted by Vinyl Institute regarding			
HERO ID:	EDC impurities. 11182965			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Release quantity:	A subgroup of 18 EDC/VCM facilities released 19,955 pounds of 1,1,2- Trichloroethane to air and water which represents approximately 51% of overall TRI releases to air and water from the total 26 facilities reporting. [PDF Pg. 5]			
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 for 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	Medium	Release media and release frequency 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:	Vinyl Institute, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.			
HERO ID:	11927540			
Conditions of Use:	Manufacturing as a Byproduct			
EXTRACTION				
Parameter	Data			
Release quantity:	A subgroup of 18 EDC/VCM facilities released 19,955 pounds of 1,1,2-Trichloroethane to air and water which represents approximately 51% of overall TRI releases to air and water from the total 26 facilities reporting (reporting year 2015).			
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 manufacturing as a non-isolated byproduct, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Data were collected after the most recent NESHAPs and 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 metadata provided.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

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:	Efs (ug/kg waste) for various VOCs uncontrolled and controlled, including chlorinated solvents included, although the list does not include 1,1,2-TCA (p. 6)
Waste treatment methods and pollution control:	Control efficiencies can be estimated using uncontrolled vs controlled emission factors (p. 6) - although no specific data for 1,1,2-TCA
Comments:	Media: Incineration; Efs (ug/kg waste) for various VOCs uncontrolled and controlled, including chlorinated solvents included, although the list does not include 1,1,2-TCA (p. 6)

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 1,1,2-TCA
	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:	OECD, (2009). Emission scenario document on adhesive formulation.			
HERO ID:	3827299			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, off-spec products			
Release quantity:	Provides models for estimating various fugitive air releases			
Release frequency:	days/yr equal to number of bt/yr			
Waste treatment methods and pollution control:	Incineration; Baghouse filters:>99% Cyclones/mechanical collectors: 80-99%			
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	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	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 various chemical functions and types of adhesives.
Overall Quality Determination		High		

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

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:	Incineration; thermal oxidizers (catalytic and thermal) and, to a lesser extent, carbon adsorbers and solvent recovery condensers as the most common control device Efficiencies: 0-100%

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	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 various chemical functions, types of adhesives, and end use markets.

Overall Quality Determination

High

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/decanter, 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, absorption, 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, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Processing: Petrochemical Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	Container cleaning, equipment and storage vessel cleaning, additive in oil/water from separation processes			
Release or emission factors:	Provides methods to estimate releases to water, surface water, deep well injection, irrigation, percolation, evaporation ponds, incineration, or land from chemicals used in oil well production.			
Release frequency:	350 days/yr			
Waste treatment methods and pollution control:	Incineration, deep well injection; Downhole produced water separation, Filter management, oil sludge minimization			
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	High	The assessment is for an occupational scenario within the scope of 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 on- and off-shore wells and chemical functions.
Overall Quality Determination		High		

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

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:	Filling/emptying: 0.05-70 kg/tonne 0.21-0.61% (solids) Storage (breathing losses): 0.01-13.1 kg/m3 storage capacity-yr Fugitive emissions from leaking seals, connectors and flanges: 0.01-1.67 g/h Storage of solids in open systems: 0.12-20 kg/tonne Container residuals: <1% (road tankers); 0.19-0.63% (rail tankers); 1% (drums); 0.3% (IBCs) Fugitive emissions during container cleaning: 1.07-311 g/container (road tanker); 0.3-2,350 g/ container (rail and ship tanker) Disposal: 0.01% (drums); 0.3% (IBCs); 0.0025-0.25 kg/bag (solids)
Waste treatment methods and pollution control:	Local Exhaust Ventilation, Filters, Vapor balancing

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:	OECD, (2015). Emission scenario document (ESD) on industrial use of industrial cleaners.
HERO ID:	6414932
Conditions of Use:	Cleaning and Degreasing Solvents

EXTRACTION

Parameter	Data
Description of release source:	draggout, evaporation from openings of the washing tank, waste cleaning solution, drying
Release quantity:	Provides methodology to estimate releases based on various parameters including: opening area of cleaning equipment, physical-chemical properties of cleaner, air velocity, etc.
Waste treatment methods and pollution control:	Natural sedimentation device: 0-50% Coagulation-sedimentation equipment: 0-95% Microorganism decomposition device (aerobic): 0-95% Membrane filtration device: 0-100% Activated carbon adsorption device: 0-90%

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	Low	This ESD is for solvents for cleaning and degreasing, which is not a condition of use for this chemical according to the COU table in the scope and also data is general and not specific to the chemical. But, the information in this ESD may be used for a similar occupational scenario from industrial/commercial use.
	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 cleaner types

Overall Quality Determination**Medium**

Study Citation:	OECD, (2009). Emission scenario documents on pulp, paper and board industry.			
HERO ID:	6558581			
Conditions of Use:	Pulp, Paper and Board Products			
EXTRACTION				
Parameter	Data			
Description of release source:	blow-down, leakages, system failure, working losses, start-up losses, wet end discharges (papermaking), boil out (papermaking), draw off (pools)			
Release or emission factors:	Example calculations. Section 5.3, P. 74			
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	Uninformative	This ESD is for pulp, paper and board products, which is not similar to any condition of use for this 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 multiple chemical functions and paper products.
Overall Quality Determination		Uninformative		

Study Citation:	OECD, (2004). Emission scenario document on water treatment chemicals.		
HERO ID:	6558582		
Conditions of Use:	Water Treatment Products		
EXTRACTION			
Parameter	Data		
Description of release source:	blow-down, leakages, system failure, working losses, start-up losses, wet end discharges (papermaking), boil out (papermaking), draw off (pools)		
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	Uninformative	This ESD is for water treatment chemicals, which is not similar to any condition of use for this 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 multiple chemical functions and system types.
Overall Quality Determination		Uninformative	

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:	Transfer operation losses of solids: 0.5%Container Cleaning (liquids in small containers): 0.6%Container Cleaning (solids): 1%Labware equipment cleaning (liquids): 2%Labware equipment cleaning (solids): 1%laboratory waste disposal: 100%
Release frequency:	260 day/yr.
Waste treatment methods and pollution control:	Labware rinsed with water. Non-hazardous chemicals to landfill. laboratory chemicals or solvents used to clean labware may be considered hazardous. hazardous waste must be disposed of by incineration or to designated hazardous waste landfills.Local ventilation, accurate labeling of wastes, using secondary containment for hazardous wastes, and contacting specialty disposal companies.

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
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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			
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:	Transfer losses of solid chemicals: 0.5%Container cleaning (liquids): 0.2%Equipment Cleaning (liquids): 2% Equipment Cleaning (solids): 1%			
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:	Provides information on waste treatment methods and pollution control devices.			
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 generic scenario 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:	Plastic material and resin manufacturing			
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:	Unloading solids: 0.1-0.5%Spillage: 0.01%Container cleaning: 1% (solids), 0.2% (bulk liquids) 0.6% (small containers for liquids) 3% (drums for liquids)Compounding dusts: 0.01-0.05%Compounding Volatiles: 0.002-0.05%Equipment Cleaning: 2%			
Release frequency:	250.			
Waste treatment methods and pollution control:	Water: According to the Development Document for Effluent Limitation Guidelines for the Plastics Molding and Forming Point Source Category (1984), approximately 31% of surveyed sites directly discharged their process water; 44% indirectly discharged (POTW); and 25% had a zero discharge. Zero discharge methods include recycling, evaporation pond, septic tank with leach field, evaporation from equipment, land application, and contract haul. Types of on-site treatment include settling, pH adjustment, activated sludge, activated carbon adsorption, filtration, and vacuum filtration.Air: The Emissions Scenario Document on Plastic Additives suggests that bag filters used to collect particulate emissions are 99% efficient. However, the prevalence of bag filter use was not available.			
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	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		High		

1,1,2-Trichloroethane

Environmental Releases

HERO ID: 6406226 Table: 1 of 1

Study Citation: U.S. EPA, (1982). An exposure and risk assessment for trichloroethanes.
HERO ID: 6406226
Conditions of Use: Processing as a reactant

EXTRACTION

Parameter	Data
Description of release source:	Chlorination of 1,2-dichloroethane, 1,2-dichloroethane purification, 1,1,2-trichloroethane production (vinyl chloride process), 1,1,2-trichloroethane production (ethane process).
Release quantity:	5,000 kkg/year (1979).
Waste treatment methods and pollution control:	Volatile organic compounds (VOC) emissions at the Dow facility are controlled by incineration and refrigerated condensers with removal efficiencies of 98 and 93%, respectively.

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 processing as a reactant, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics (single estimates 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	Medium	Variability addressed by discussing emissions from different sources, but uncertainty is not addressed.

Overall Quality Determination

Medium

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	Equipment cleaning and spillage (P. 26/44)			
Release quantity:	Water: 1,013 kg/site-day, 20 batches per yearLand: 7,800 kg/yr			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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 a frequently used source	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Description of release source:	Spillage during transfer and sampling			
Release quantity:	Water: 0.7 kg/site-dayAir, direct: Negligible (P29/44)			
Release frequency:	300 days			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Industrial use			
EXTRACTION				
Parameter	Data			
Description of release source:	release to air due to vaporization (P 35/44)			
Release quantity:	Water: Not ExpectedAir, direct: NegligibleLand: Not expectedIncineration: IRIR = LOP X TAO.% X PMNx 0.4545 kg/lb x 75 lbs/gal x 1,000,000 gal/MgalAmount of PMN chemical released due to incineration			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.				
HERO ID:	7311175				
Conditions of Use:	Consumer use, DIY				
EXTRACTION					
Parameter	Data				
Description of release source:	Incineration release from burning of used oil (P 38/44)				
Release quantity:	Water: Not ExpectedAir, direct: NegligibleIncineration: IRIR = LOP X TAO% X BO% X PMNc 0.4545 kg/lb x 75 lbs/gal x 1,000,000 gal/MgalAmount of PMN chemical released due to incinerationLand: LR (kg/yr)LR= LOP x TAO% x (LFO%+DO%) x PMN x 0.4545 kg/lb x 7.5 lbs/gal x 1,000,000 gal/Mgal				
Release frequency:	8 days/yr				
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.				
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.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States	
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.	
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.	
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination			High		

Study Citation:	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.			
HERO ID:	5478191			
Conditions of Use:	Recycle			
EXTRACTION				
Parameter	Data			
Description of release source:	Solvent recycling waste water treatment plant			
Release or emission factors:	Media: water. Effluent: 20 (ppb) (Pg. 83)			
Release frequency:	260 days/yr			
Waste treatment methods and pollution control:	Steam stripping (99% removal) (Pg. 83)			
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 recycling, 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	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:	ATSDR, (1989). Toxicological profile for 1,1,2-trichloroethane.			
HERO ID:	664390			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source: Timber products, organics and plastics, inorganic chemicals, plastics and synthetics, auto and other laundries, organic chemicals, mechanical products, transportation equipment, synfuels, POTWs				
Release quantity:	Air: 10,000 - 20,000 (million tons/yr)			
Release or emission factors:	Water: 1.2 - 203.77 (ppb) (Pg. 73)			
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	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 analyzing multiple release sources but uncertainty is not addressed.	
Overall Quality Determination		High		

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:	WWT; air stripping - limited to aqueous wastes with organics concentration <100 mg/L (pg 4); steam stripping; packed tower air stripper: >99% removal of volatile organics from water; steam stripping: 99% (pg 3)			
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 disposal, an in-scope occupational scenario; however data is not specific to chemical (overall efficiency).
	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	pollution control efficiency
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	High	Data are for various in-scope occupational scenarios.
	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	release source info
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	release source info
Overall Quality Determination			High	

Study Citation: Compaan, H. (1988). Waste incineration at sea. :257-274.
HERO ID: 664396
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Description of release source:	Incineration
Release quantity:	100,000 (tons/yr) (all organochlorines) (Pg. 270)
Waste treatment methods and pollution control:	Permit 1, which has to be renewed every 2 years, it is necessary to measure not only the combustion efficiency, but also the destruction efficiency. The last one is a rather difficult and specialized type of measurement. The second permit concerns the type of waste. Some types of organochlorine waste can give rise to special problems. "Herbicide Orange" is an example, because it contains traces of chlorinated dioxins, which also could be produced during incomplete combustion. PCB's are another example, because they contain traces of chlorinated dibenzofuranes, which could be formed as well during incomplete combustion. (Even the incomplete combustion of dichloro-ethane can be the cause of the formation of chlorinated dioxins (Marklund et al. 1987).) For the incineration of these special types of waste, so-called "research" and/or "special" permits were obtained and it was proven in three, and then two voyages that trichlorophenol-based herbicides and PCB's can be combusted and destroyed with very high efficiency.
Comments:	Media: air; Volumes for length, width, draught, unladen capacity, tank capacity, provided. Oven temperature: 1250oC

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.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario, but the chemical is not specifically 1,1,2-TCA.
	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	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:	Ecology and Environment, (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]; chemical acronyms (pg 92)

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], building 14 clarifiers, Building 11 tanks [underground tanks west of building 11, pg 78], building 35 organics sump, underground tank south of building 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), Temporary drum storage area (building 29), Test site 2 and 3 (pg 73-81) "
Release or emission factors:	pg 98-267 has soil/groundwater sampling results, not emission factors but may be usable (also did not find any area sampling data which was tagged for this source, FT screener may have gotten the soil/water sampling results confused); more groundwater/soil sampling results presented throughout, e.g. App. B
Waste treatment methods and pollution control:	"6-well extraction system" to pump up and treat contaminated groundwater at site via air stripping (pg 22); more detail pg 26-7; pg 379-80 presents data on influent and effluent concentrations for groundwater air stripping, can likely be adapted for other COUs (since groundwater treatment is out of scope); pg 381 says 99.9% effective
Comments:	media: land (groundwater); fugitive air (volatilization)

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/groundwater sampling analysis).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for cleaning and degreasing solvents, 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	High	Statistical distribution of samples is fully characterized (discrete sampling data 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	Variability addressed by considering multiple remediation/pollution prevention methods for each release source, but uncertainty is not addressed.

Overall Quality Determination**High**

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
HERO ID:	7349020			
Conditions of Use:	Intermediate in plastic manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	The primary sources of emissions at plastic products manufacturing facilities are the pieces of equipment (e.g., extruder hopper, die head, sander) used to handle raw materials and produce the final product. These are typically the locations where chemical reactions occur, liquid solvents and solvent blends are exposed to the atmosphere, solid resin is heated and melted, and additives are introduced. In addition to emissions generated directly from primary production processes associated with plastic products manufacturing, there may be additional emissions produced by secondary processes at these facilities. Emission sources from these secondary processes include storage tanks, equipment leaks, wastewater treatment, combustion sources, and cleaning and surface coating operations. (Page 17 of pdf)			
Waste treatment methods and pollution control:	It is expected that VOC and organic HAP emissions could be controlled by incineration, adsorption, absorption, or condensation. Incineration and carbon adsorption have been identified as technologies currently in use at polystyrene foam manufacturing facilities (EPA, 1990). (Page 21 of pdf)			
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 intermediates in plastic manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or 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	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Intermediate			
EXTRACTION				
Parameter	Data			
Description of release source:	1,1,2-Trichloroethane may enter the atmosphere from its use in the manufacture of vinylidene chloride and its use as a solvent. It may also be discharged in wastewater associated with these uses and in leachates and volatile emissions from landfills. pg 1161			
Comments:	Media: Air; Water			
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	description of release source	
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	description of release source	
Overall Quality Determination		High		

1,1,2-Trichloroethane

Environmental Releases

HERO ID: 201838 Table: 2 of 2

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	All other chemical product and preparation manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:	1,1,2-Trichloroethane may enter the atmosphere from its use in the manufacture of vinylidene chloride and its use as a solvent. It may also be discharged in wastewater associated with these uses and in leachates and volatile emissions from landfills. pg 1161			
Comments:	Media: Air; Water			
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 other chemical product and preparation 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	description of release source
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	description of release source
Overall Quality Determination			High	

Study Citation:	Middleton, P., Sockwell, R., Carter, L., W.P. (1990). Aggregation and analysis of volatile organic compound emissions for regional modeling. Atmospheric Environment, Part A: General Topics 24(5):1107-1133.			
HERO ID:	87136			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Open burning - all types (Pg. 14, 23)			
Release quantity:	0 (metric tonnes/year)			
Comments:	Media: air			
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.
	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	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:	Miller, C., Srivastava, R. K., Ryan, J. V. (1994). Emissions of organic hazardous air pollutants from the combustion of pulverized coal in a small-scale combustor. Environmental Science & Technology 28(6):1150.			
HERO ID:	5705544			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Coal combustion			
Release or emission factors:	Media: Air; 3 different types of coal burning operations. (1) Baseline coal: Max:4.179*10^-7 (lb/10^6 BTU) and Min: 0.0 (2) SR Variation: max:4.274*10^-7 (lb/10^6 BTU) and min: 0.0,(3) Low NOx Condition: max:4.170*10^-7 (lb/10^6 BTU) and min:0.0 (Pg. 5)			
Comments:	Maximum values assume compounds not detected at the instrument detection level; minimum values assume compounds not detected are at zero concentration. Emission factors are in lb/10^6 Btu.			
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.
	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	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	Medium	Variability addressed by testing different types of operations but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 6574, 1,1,2-Trichloroethane.			
HERO ID:	7681897			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Manufacture and processing as a reactant for the production 1,1-DCA.			
Waste treatment methods and pollution control:	Trichloroethane is a waste chemical stream constituent which may be subjected to ultimate disposal by controlled incineration. Incineration, preferably after mixing with another combustible fuel; care must be exercised to assure complete combustion to prevent the formation of phosgene. An acid scrubber is necessary to remove the halo acids.			
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	Information is from referenced source which is more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - release source and waste treatment methods.
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 - release source and waste treatment methods.
Overall Quality Determination		High		

Study Citation:	Oil,, Shell (1982). Tertiary water treatment I. A preliminary assessment of active carbon sorption.			
HERO ID:	1441911			
Conditions of Use:	Disposal: Wastewater treatment			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Filtration/Activated Carbon Technology - lab scale study of plant effluents to study effectiveness. 60-70% effective for TOC in lab-scale studies in first 300 hours (page 38), Strength of adsorption on active carbon is strong for 1,1,2TCE (page 44).			
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.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	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		Medium		

Study Citation:	Randel, S. (1989). Nine plants enter an environmental world. Chemical Business 11(9):27-29.			
HERO ID:	5441866			
Conditions of Use:	Manufacturing: As a byproduct from Chemical Product Manufacturing			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	"1989 Corpus Christi plant: (Page 1) ""To control emissions, all gases go through one of two vent gas incinerators—the plant has 100 percent spare capacity for maintenance purposes."" (Page 2) ""Waste water is stripped of as much EDC as possible, and any hazardous waste is incinerated. "" ""Part of the waste stream, primarily 1,1,2, trichlorethane, is sold as byproduct to B.F. Goodrich Co. for EDC feedstock """"			
Comments:	release media: air, land, water. PV and throughput data for other chemicals.			
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.
	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	No sample data.
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	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Rosenfeld, P. E., Feng, H., L.G. (2011). The petroleum industry. :57-71.			
HERO ID:	6108171			
Conditions of Use:	Processing aid: petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	venting, leaking (valves, storage tanks, support equipment, etc.), emissions from fuel combustion devices (pg 2); 40,000 oil and gas fields of varying sizes throughout world, 94% of which concentrated in fewer than 1,500 giant and major fields (pg 6-7 of pdf, pg. 62-63 of the document)			
Release quantity:	"unreported fugitive emissions add 'over 80 million pounds of VOCs and over 15 million pounds of toxic pollutants' very year" (pg 2); "In 1997, Louisiana ranked second in the nation, behind Texas, in the amount of toxic substances released into the air and water: 183 million tons of toxic chemicals were emitted that year alone... Between 1958 and 1973, Dow Corporation buried 46,000 tons of toxic waste in unlined pits that now cover more than 30 underground acres (pg 5)			
Waste treatment methods and pollution control:	incineration, land treating (off-site), chemical fixation, neutralization, WWT, burning as fuel (sludge) (pg 3-4)			
Comments:	Media: air, landfill (solid waste, sludge), water, deepwell injectionTable 5.1 Solid Wastes Generated in Petroleum Refining Listed as Hazardous Waste by theEPA (EPA, 2010c)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (EPA, other agencies and industry).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for processing aids: petroleum production, an in-scope occupational scenario; however, release sources/estimates are not specific to any chlorinated solvent (just mentions chlorinated solvents as a type of waste)
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics (single estimates 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	Variability addressed by considering varying geographies and waste/treatment types, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.			
HERO ID:	13246147			
Conditions of Use:	Manufacturing as a byproduct at chemical manufacturing facilities, Processing as a reactant, Use of cleaning and degreasing solvents, Disposal to incineration, and Disposal to landfill			
EXTRACTION				
Parameter	Data			
Description of release source:	TRI provides NAICS codes related to operations for each facility which may be used to derive release sources for each OES.			
Release quantity:	TRI provides annual release quantities for facilities performing multiple in-scope OES operations.			
Waste treatment methods and pollution control:	TRI provides TRI use codes which may be used to derive waste handling methods (landfill, POTW, Incineration).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The U.S. EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are applicable to multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Data are from 2019-2023.
	Metric 5:	Sample Size	Medium	Universe is limited to TRI reporting facilities; statistical representativeness is unclear so number of sites may not be fully accurate.
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	TRI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). National Emissions Inventory (NEI): 1,1,2-Trichloroethane, reporting years 2017 and 2020.
HERO ID:	13246148
Conditions of Use:	Manufacturing as a byproduct in chemical manufacturing, Manufacturing as a byproduct in pulp and paper industry, Repackaging (Import), Processing as a reactant (Intermediate), Use of cleaning and degreasing solvents, Industrial use of adhesives and sealants, Use of laboratory chemicals, Disposal to incineration, Disposal to landfill, Disposal to POTW, Disposal to non-POTW WWT, Remediation

EXTRACTION

Parameter	Data
Description of release source:	Provides unit/process of release for multiple OES.
Release quantity:	Provides release data for multiple OES.
Release or emission factors:	Provides emission factors for multiple OES.
Release frequency:	Provides annual operating time for multiple OES.
Waste treatment methods and pollution control:	Provides controls information for multiple OES.
Comments:	Document was tagged for life cycle description and throughput, however, NEI does not contain this data so these data were not extracted.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High NEI is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High NEI data is from the U.S.
	Metric 3:	Applicability	High NEI data apply to multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High NEI data are from 2017 and 2020.
	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 All data sources, methods, results, and assumptions are clearly documented.
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:	NIOSH, (1985). Health hazard evaluation report no. HETA-84-214-1633, Sheldahl, Inc., Northfield, Minnesota.. NIOSH(HETA-84-214-1633):84-214.			
HERO ID:	3974905			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Process description:	Mixing of adhesives involves combining the various components that make an adhesive, and blending them together on a power mixer. Components include solid resins such as polyester, epoxy or nylon; solvents such as methylene chloride, methyl ethyl ketone (MEK), acetone, and smaller quantities of 1,1,2-trichloroethane, methanol, and others; and additives such as powders. dyes, and isocyanate curing agents. (more details on Pg. 6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment 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 adhesives and sealants, 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	N/A	process description
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, (2009). Emission scenario document on adhesive formulation.			
HERO ID:	3827299			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	15.8-4,990 million kg adhesive/yr			
Process description:	Unloading raw materials from containers into mixing vessel, mixing, packaging/on-site storage			
Throughput:	Provides methodology for estimating throughput based on the amount of adhesive produced, and the concentration of the chemical in the adhesive			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the adhesive use rate, and the concentration of the chemical in the adhesive formulation			
Chemical concentration:	Provides conc. estimates based on chemical function, 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	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 various chemical functions and types of adhesives.	
Overall Quality Determination		High		

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.			
HERO ID:	3827300			
Conditions of Use:	Adhesives and sealants			
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:	Provides methodology for estimating throughput based on the amount of adhesives 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	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 various chemical functions, types of adhesives, and end use markets.	
Overall Quality Determination		High		

Study Citation:	OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.			
HERO ID:	5185306			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	153,000 (tonnes/year) (Japan) (Pg. 4)			
Comments:	page 230			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
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	Low	The assessment does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Processing: Petrochemical Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	703-112,875 bbl/well-yr			
Process description:	container unloading, storage, pumped into oil well, extracted, temporary storage tank or separation process, natural gas processing/refinery/disposal			
Throughput:	1.29-3.86 million bbl oil/day			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, oil production rate, and operating days			
Chemical concentration:	Provides conc. estimates based on chemical function, 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	High	The assessment is for an occupational scenario within the scope of 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 on- and off-shore wells and chemical functions.	
Overall Quality Determination		High		

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.		
HERO ID:	6393282		
Conditions of Use:	Transportation and Storage (Processing, distribution in commerce)		
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:	OECD, (2015). Emission scenario document (ESD) on industrial use of industrial cleaners.			
HERO ID:	6414932			
Conditions of Use:	Cleaning and Degreasing Solvents			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1-12,961 tonne/yr (Japan)			
Process description:	Provides descriptions for a variety of cleaning methods including ultrasonic, jet washing, oscillate (rotate) washing, mechanical vibration stirring, bubble washing, reduced pressure (vacuum) washing, jet (spray, shower) washing, steam washing			
Chemical concentration:	Provides conc. estimates based on type of cleaner, 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	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Low	This ESD is for solvents for cleaning and degreasing, which is not a condition of use for this chemical according to the COU table in the scope and also data is general and not specific to the chemical. But, the information in this ESD may be used for a similar occupational scenario from industrial/commercial use.
	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 cleaner types
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario documents on pulp, paper and board industry.		
HERO ID:	6558581		
Conditions of Use:	Pulp, Paper and Board Products		
EXTRACTION			
Parameter	Data		
Process description:	Paper-making: Stock preparation, wet end operation, pressing, drying, finishing, reel-up Recycling Fiber Processing: repulping, enzymatic dye-inking, high density cleaning, screening (perforated), screening (slotted), low consistency cleaning, flotation, thickening, washing, depurging/dispersion, dissolved air flotation, high density storage, bleaching		
Throughput:	0.001-100 kg ink or coating/tonne paper		
Chemical concentration:	Provides conc. estimates based on the chemical function and type of paper product, 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	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Uninformative	This ESD is for pulp, paper and board products, which is not similar to any condition of use for this 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 multiple chemical functions and paper products.
Overall Quality Determination		Uninformative	

Study Citation:	OECD, (2004). Emission scenario document on water treatment chemicals.		
HERO ID:	6558582		
Conditions of Use:	Water Treatment Products		
EXTRACTION			
Parameter	Data		
Process description:	Provides process descriptions for water treatment chemicals used in closed cooling and heating systems, open cooling systems, papermaking, and swimming pools		
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 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	Uninformative	This ESD is for water treatment chemicals, which is not similar to any condition of use for this 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 multiple chemical functions and system types.
Overall Quality Determination		Uninformative	

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
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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			
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 generic scenario 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.
Continued on next page ...				

General Engineering Assessment

1,1,2-Trichloroethane

HERO ID: 11182966 Table: 1 of 1

...continued from previous page

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			
Domain		Metric	EVALUATION	
			Rating	Comments
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 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:	Plastic material and resin manufacturing

EXTRACTION	
Parameter	Data
Process description:	Compounded resins received, unloaded, forming/molding/shaping, trimming, finishing (including coating operations).
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic. 137-254 days/yr.
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	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 multiple plastic and additive types.

Overall Quality Determination	High
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Study Citation:	U.S. EPA, (1982). An exposure and risk assessment for trichloroethanes.			
HERO ID:	6406226			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	180,000 MT/year.			
Process description:	The 1,1,2- isomer is produced in the U.S. directly or indirectly from ethylene and is also produced as a co-product in the manufacture of other chlorinated hydrocarbons.			
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 that are greater than 20 years old.
	Metric 5:	Sample Size	N/A	Process description.
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, (2000). Generic scenario on lube oil additives.		
HERO ID:	7311175		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	In 1988, gasoline engine oils and diesel engine oilsaccounted for 65% of the LOA demand in the U.S. Lubricating Oil sale 2472 Mgal/yr. (P. 22/44)500,000 kg/yr-site (P 24/44)		
Process description:	Most additive components are manufactured in batch processes, but a few are produced by continuous chemical processes (or a portion of the total process is continuous). The size of the batch can vary from 5 metric tons to over 100 metric tons.		
Number of sites:	78,766 general automotive sitestwo manufacturing sites		
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.		
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 a frequently used source
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.			
HERO ID:	7311175			
Conditions of Use:	Industrial use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production volume of oil in Mgal/yr, LOP = (PV IPMNC) x 2.2 lb/kg :w: 0.133 gal/lb / 1,000,000 gal/Mgal			
Life cycle description:	Maintenance workers drain oil from machinery and add fresh oil containing approximately 1% of the PMN chemical. The used oil is collected and recycled			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			
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.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.
HERO ID:	7311175
Conditions of Use:	Processing

EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Lube oil production volume in Mgal/yr,LOP = (PV /PMNc) x 2.2 lb/Kg x 0.133 gal/lb / 1,000,000 gal/Mgal (P 27/44)			
Process description:	The blending process usually takes place in-line and the final product is packaged. in cans or drums.			
Throughput:	Lube oil production volume per site in Mgal/yrLOPs = 100,000 bbls/day x 0.01 x 42 gal/bbl x 350 days/yr/ 1,000,000 gal/Mgal			
Chemical concentration:	The final concentration of the PMN chemical ranges from 0.5 to 20%.			
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.			

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
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination	High
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Study Citation:	U.S. EPA, (2000). Generic scenario on lube oil additives.
HERO ID:	7311175
Conditions of Use:	Consumer use, DYI

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Total lube oil production (2,472 Mgal/yr)Production volume of oil in Mgal/yrLOP= (PV/PMN,) x 2.2 lb/kg x 0.133 gal/lb/ 1,000,000 gal/Mgal (P 36/44)
Number of sites:	NC= 255 Mgal/yr x LO% x 1,000,000 gal/Mgal / 8.4 gal/yr
Chemical concentration:	Concentration of PMN in Lube oil (default= 1 %)
Comments:	The COU table and process descriptions in the 1,1,2-Trichloroethane Scope Document does not include any mention of the use of 1,1,2-Trichloroethane in lube oils.

		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
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation. Generic scenarios.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.

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

EXTRACTION	
Parameter	Data
Process description:	Impurities are contained in mixed chlorinated organics unintentionally produced during the catalytic oxychlorination of ethylene to make EDC, the raw material precursor for conversion by thermal cracking into vinyl chloride monomer (VCM). 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. [PDF Pg. 2] 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. In each process, quantities of impurities are converted to feedstocks and essentially eliminated. [PDF Pg. 3]
Number of sites:	18 facilities which release 1,1,2-TCA [PDF Pg. 5]
Chemical concentration:	Concentration During EDC/VCM Manufacture (weight %)[PDF Pg. 3] Light ends: 0-<0.1% Heavy ends: 15-50% EDC Product: 0-0.002% VCM Product: 0% Yield of 1,1,2-TCA During EDC/VCM Manufacture (lb/100 lb EDC; lb/100lb VCM) [PDF Pg. 4] Light ends: 0-0.003 Heavy ends: 0.141-0.469 EDC Product: 0-0.02 VCM Product: 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	Sample distribution characterized by 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 addressed by giving compositions and yields in light ends, heavy ends, EDC product, and VCM product but uncertainty is not addressed.

Overall Quality Determination

High

Study Citation:	ACA, (2019). Comment submitted by Raleigh Davis, Assistant Director and Riaz Zaman, Counsel, Government Affairs, American Coatings Association (ACA) regarding the proposed 20 high priority candidates for chemical risk evaluation.				
HERO ID:	10369850				
Conditions of Use:	Adhesives and Sealants				
EXTRACTION					
Parameter	Data				
Chemical concentration:	1,1,2-Trichloroethane is found as an impurity in some adhesives in amounts between 0.1% and 10%.				
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 adhesives and sealants, 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	Sample distribution characterized by 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	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination			High		

Study Citation:	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.			
HERO ID:	5478191			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Process description:	Mechanical separation (decanting, filtering, draining, settling, and centrifugation); distillation; purification (decanting or salting); storage and handling. (Pg. 32-35)			
Number of sites:	210 (Pg. 29)			
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 recycling, 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	process description	
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:	ATSDR, (1989). Toxicological profile for 1,1,2-trichloroethane.			
HERO ID:	664390			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	412 (million lbs.) (1979) (Pg. 70)			
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	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:	Belpoggi, F., Chiozzotto, D., Lauriola, M. (2012). Unsaturated halogenated hydrocarbons. :129-229.			
HERO ID:	4332198			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	1,2-DCE is synthesized by direct chlorination of acetylene at 40 C, by dehydrochlorination of 1,1,2-trichloroethane at 500 C.VDC is prepared commercially by the dehydrochlorination of 1,1,2-trichloroethane using a slight excess of lime or caustic as shown in the reaction schematic (349).			
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 as a reactant, 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 - Process description info.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

General Engineering Assessment

Study Citation:	Santa Cruz Biotechnology, (2019). Safety Data Sheet (SDS): 1,1,2-			
HERO ID:	Trichloroethane. 13246145			
Conditions of Use:	Use of laboratory chemicals			
EXTRACTION				
Parameter	Data			
Chemical concentration:	>95%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2019, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Chiang, H. L., Lin, W. H., Lai, J. S., Wang, W. C. (2010). Inhalation risk assessment of exposure to the selected volatile organic compounds (VOCs) emitted from the facilities of a steel plant. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 45(11):1397-1405.			
HERO ID:	832709			
Conditions of Use:	Steel manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Very general process descriptions given for sintering, cokemaking, cold forming, and hot forming processes.			
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	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	Uninformative	Data are for steel manufacturing, which is not similar to 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	process description
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	Medium	Variability addressed by analyzing different processes but uncertainty is not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Cowfer, J. A., Gorenssek, M. B. (2006). Vinyl chloride. :1-31.			
HERO ID:	6301240			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Chlorine adds to vinyl chloride to form 1,1,2-trichloroethane [79-00-5] (44–46). Chlorination can proceed by either an ionic or a radical path. In the liquid phase and in the dark, 1,1,2-trichloroethane forms by an ionic path when a transition-metal catalyst such as ferric chloride [7705-08-0], FeCl3, is used.			
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.
	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 10 but less than 20 years old.
	Metric 5:	Sample Size	N/A	Process description info.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Dow Chemical, (1988). Mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant with cover letter dated 050389.			
HERO ID:	1441931			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Process description:	The Per-Tet production plant was built in 1944. It produces carbon tetrachloride (CC4), perchloroethylene (PCE) and hydrochloric acid. Feedstocks for the Per-Tet thermochlorination reaction, excluding chlorine, consist of by-product streams from other chlorinated hydrocarbon production units in Texas Operations (Table 1). While process changes have been few, the sources of feedstock have differed. The major feedstock has been propylene dichloride (PDC). Crude PDC was piped to a PDC Finishing Unit where heavy and light contaminants were removed by distillation. The finished PDC was then fed to the Per-Tet process;’ (p. 7) 1,1,2-Trichloroethane mentioned on p. 17 as a feedstock.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report appears to use high quality techniques/sound methods and was submitted to EPA by a company.
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 - no sample data
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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 - process description.
Overall Quality Determination		High		

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)is primarily an unwanted byproduct of several chlorination processes, such as the production of 1,2-dichloroethane and the chlorination of ethane or 1,1-dichloroethane to 1,1,1-trichloroethane (more detail pg 22-23)			
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	PD info
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	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
HERO ID:	7349020			
Conditions of Use:	Intermediate in plastic manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Lamination is the binding and fusing of multiple layers with heat and pressure. All thermosets can be used as laminating binders; however, phenolic is the most common binder used in lamination. Most laminating operations involve the following three basic steps: impregnation, drying, and pressing. First, a web of paper, fabric, or other material is impregnated with a resin solution by continuously feeding it through a dip tank. Next, excess resin is removed and the web is dried. The drying, which takes place in an oven, vaporizes the solvent and helps increase the molecular weight of the resin via additional chemical reactions. (page 46 of pdf document)			
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 intermediates in plastic manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data that are greater than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - Process description info.	
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	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	Fishbein, L. (1979). Potential halogenated industrial carcinogenic and mutagenic chemicals. I. Halogenated unsaturated hydrocarbons. Science of the Total Environment 11(2):111-161.			
HERO ID:	1441315			
Conditions of Use:	Processing as a reactant or intermediate			
EXTRACTION				
Parameter	Data			
Process description:	A typical commercial grade of vinylidene chloride, 99.7% by weight as prepared by dehydrochlorination of 1,1,2-trichloroethane with lime or caustic [117]. (Pg. 14)			
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 Japan, an OECD country.	
	Metric 3: Applicability	High	Data are for processing as a reactant or 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	process description	
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:	Fishbein, L. (1979). Potential halogenated industrial carcinogenic and mutagenic chemicals. II. Halogenated saturated hydrocarbons. Science of the Total Environment 11(2):163-195.			
HERO ID:	9900			
Conditions of Use:	MFG			
EXTRACTION				
Parameter	Data			
Process description:	1,1,2-Trichloroethane is produced either directly from acetylene, or indirectly from ethylene. . . . (PDF pg 14 for detail)			
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	Process description	
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	Process description	
Overall Quality Determination		High		

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	186,000 tonnes (1980s) pg 1160			
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	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	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by production volumes from multiple years but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Li, R., Xu, A., Zhao, Y., Chang, H., Li, X., Lin, G. (2022). Genetic algorithm (GA) - Artificial neural network (ANN) modeling for the emission rates of toxic volatile organic compounds (VOCs) emitted from landfill working surface. Journal of Environmental Management 305:114433.			
HERO ID:	10164739			
Conditions of Use:	Waste Handling, Treatment and Disposal (Landfills)			
EXTRACTION				
Parameter	Data			
Throughput:	The design capacity of thelandfill was 1400 t/d with a service life of 25 years.			
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	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for waste handling (landfills), an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (average, standard deviation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by continuous sampling over a nine-month period. but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.		
HERO ID:	3828879		
Conditions of Use:	Processing as a reactant		
EXTRACTION			
Parameter	Data		
Process description:	The 1,1,2-trichloroethane feedstock to produce vinylidene chloride may be obtained as a by-product of the manufacture of EDC or 1,1,1-trichloroethane.It may also be produced from EDC by a liquid-phase chlorination process. The liquid-phase chlorination of EDC to 1,1,2-trichloroethane also results in the coproduction of HCl. Tetrachloroethane isomers are a by-product of the production of 1,1,2-trichloroethane. Once the 1,1,2-trichloroethane has been produced and purified, it is dehydrochlorinated to produce vinylidene chloride. The most common route is to react aqueous sodium hydroxide with the 1,1,2-trichloroethane. This process has the advantage of producing vinylidene chloride at a very high selectivity relative to the production of the cis- and trans-1,2-dichloroethylene isomers. A small amount of monochloroacetylene is also produced as a by-product of this process. The main disadvantage of this process is that the chlorine that is removed from the feedstock is converted to sodium chloride, which cannot be readily reused. Vapor-phase thermal dehydrochlorination of 1,1,2-trichloroethane has the advantage of producing the HCl coproduct in anhydrous form so that it is more easily recovered. However, selectivities to vinylidene are typically poor. The coproducts of this process are cis- and trans-1,2-dichloroethylene. These byproducts must be rehydrochlorinated and recycled to obtain acceptable overall yields.		
Comments:	See Fig. 1		
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.
	Metric 3: Applicability	High	Data are for processing as a reactant, 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 - Process description info
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High	

Study Citation:	Midwest Research Institute, (1984). Performance evaluation of full-scale hazardous waste incinerators - Volume I (excutive summary) contract no. 68-02-3177 (43).			
HERO ID:	1269556			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Throughput:	Input to haz. Waste incinerator: 27-37 g/min (pg 403)			
Number of sites:	Values come from 1 site			
Chemical concentration:	Concentration in drum waste to chamber (μg/g): 2,300-2,600 (pg 402)			
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	Low	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	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	Medium	Variability addressed by conducting multiple sampling runs and by using two different sampling methods, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	NCBI, (2020). PubChem Compound Summary for CID 6574, 1,1,2-Trichloroethane.			
HERO ID:	7681897			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1986: >100 million - 500 million; 1990: >100 million - 500 million; 1994: >10 million - 50 million; 1998: >100 million - 500 million; 2002: >100 million - 500 million.			
Process description:	1,1,2-trichloroethane is produced by reaction of acetylene gas with a mixture of hydrogen chloride and chlorine in the presence of catalyst or by chlorination of ethylene followed by chlorination of the 1,2-dichloroethane intermediate.			
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	Most of the information is more than 20 years old.
	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	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple years of production data, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	NIOSH, (1981). Permeation of protective garment materials by liquid halogenated ethanes and a polychlorinated biphenyl.			
HERO ID:	5476924			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	124,000,000 (lbs)			
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	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:	NIOSH, (1983). In-depth industrial hygiene survey report of the arrow shirt company Atlanta, Georgia no: 125.12 (36). 14:B2-14.			
HERO ID:	5908875			
Conditions of Use:	Dry cleaning agent			
EXTRACTION				
Parameter	Data			
Throughput:	1,600 dozen shirts/day (Pg. 6)			
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	Uninformative	Data are for use as a dry cleaning agent which is not in-scope or similar to 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	just throughput
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			Uninformative	

Study Citation:	Nunez, C., McMinn, B., Vitas, J. (1996). Barriers to the use of radiation-curable adhesives in the coated and laminated substrate manufacturing industry. Journal of Hazardous Materials 45(1):59-78.			
HERO ID:	5466433			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Process description:	See section 3.3 on PDF Pg. 5			
Comments:	This paper talks about general use of sealants and adhesives, however it doesn't mention the particular chemical species.			
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.
	Metric 3:	Applicability	Medium	Data are for adhesives and sealants, an in-scope occupational scenario. But, no data for the particular 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 - process description
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	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Reed, D. J. (2000). Chlorocarbons and chlorohydrocarbons, survey.				
HERO ID:	7310689				
Conditions of Use:	Manufacturing				
EXTRACTION					
Parameter	Data				
Production, import, or use volume:	U.S. demand in 1987: 109,000 tons; 1989: 108,000 tons; 1995: 104,000 tons.				
Life cycle description:	Figure 1 shows the reaction pathways.				
Process description:	Thermal chlorination of dichloroethane is one route to commercial production of trichloroethylene.				
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.	
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4:	Temporal Representativeness	Low	Report is based on data that are greater than 20 years old.	
	Metric 5:	Sample Size	N/A	N/A - Process description info.	
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	The report provides only limited discussion of the variability and uncertainty in the results.	
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:	187*10^6 (kg) Pg. 51.			
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. The data is from the report by DHHS in Atlanta, GA.
	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	Low	Sample distribution is described qualitatively.
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:	All			
EXTRACTION				
Parameter	Data			
Number of sites: Used to develop a method to estimate number of sites and workers.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	BLS is expected to use reliable survey methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. based economic data.
	Metric 3:	Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	The BLS OES data are from 2021.
	Metric 5:	Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Manufacture and Import			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides U.S. domestic manufactured and imported PV and %PV to downstream uses.			
Number of sites:	Provides number of manufacturing and import sites.			
Chemical concentration:	Provides concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	CDR covers chemical manufacturers and importers, which are in scope for all chemicals.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

General Engineering Assessment

Study Citation:	U.S. EPA, (2023). Discharge Monitoring Report (DMR): 1,1,2-Trichloroethane, reporting years 2019-2023.				
HERO ID:	13246146				
Conditions of Use:	Manufacturing as a byproduct, Processing as a reactant, Distribution in commerce, Use of laboratory chemicals, and waste handling, disposal, and treatment				
EXTRACTION					
Parameter	Data				
Number of sites:	DMR data provides site-specific information for multiple OES allowing for the number of sites for each OES to be calculated.				
Comments:	Document was tagged for life cycle information and throughput but does not provide that information.				
EVALUATION					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	DMR is U.S. based data.	
	Metric 3:	Applicability	High	DMR includes data for multiple in-scope OES.	
	Metric 4:	Temporal Representativeness	High	Data are from 2019-2023.	
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear so number of sites may not be fully accurate.	
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	DMR does not address variability or uncertainty in submitter provided data.	
Overall Quality Determination			High		

General Engineering Assessment

Study Citation:	U.S. EPA, (2023). Toxics Release Inventory (TRI): 1,1,2-Trichloroethane, reporting years 2019-2023.			
HERO ID:	13246147			
Conditions of Use:	Manufacturing as a byproduct at chemical manufacturing facilities, Processing as a reactant, Use of cleaning and degreasing solvents, Disposal to incineration, and Disposal to landfill			
EXTRACTION				
Parameter	Data			
Number of sites:	TRI provides discrete site identities which are used to develop a number of sites for each OES.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The U.S. EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are applicable to multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Data are from 2019-2023.
	Metric 5:	Sample Size	Medium	Universe is limited to TRI reporting facilities; statistical representativeness is unclear so number of sites may not be fully accurate.
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	TRI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2020). National Emissions Inventory (NEI): 1,1,2-Trichloroethane, reporting years 2017 and 2020.			
HERO ID:	13246148			
Conditions of Use:	Manufacturing as a byproduct in chemical manufacturing, Manufacturing as a byproduct in pulp and paper industry, Repackaging (Import), Processing as a reactant (Intermediate), Use of cleaning and degreasing solvents, Industrial use of adhesives and sealants, Use of laboratory chemicals, Disposal to incineration, Disposal to landfill, Disposal to POTW, Disposal to non-POTW WWT, Remediation			
EXTRACTION				
Parameter	Data			
Number of sites:	NEI provides discrete site identities allowing for a count of number of sites for each OES.			
Comments:	Document was tagged for life cycle description and throughput, however, NEI does not contain this data so these data were not extracted.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	NEI is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	NEI data is from the U.S.	
	Metric 3: Applicability	High	NEI data apply to multiple in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	High	NEI data are from 2017 and 2020.	
	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	All data sources, methods, results, and assumptions are clearly documented.	
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, (2026). Chemical Data Reporting (CDR): Reporting year 2024.			
HERO ID:	13246149			
Conditions of Use:	Manufacture and Processing as a reactant,			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides PV for multiple OES.			
Life cycle description:	Provides %PV to downstream OES uses.			
Number of sites:	Provides number of sites for multiple OES.			
Chemical concentration:	Provides concentration for multiple OES.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	CDR is U.S. based data.
	Metric 3:	Applicability	High	CDR covers multiple OES, which are in scope for the chemical.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2024 CDR.
	Metric 5:	Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

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 in Figure 4.7.1 on PDF Pg. 584.			
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 recycling, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - Process description info.
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	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1990). Final best demonstrated available technology (BDAT) background document addendum for F002 (1,1,2-trichloroethane) and F005 (benzene, 2-ethoxyethanol and 2-nitropropane).
HERO ID:	7306159
Conditions of Use:	Processing as a reactant or intermediate

EXTRACTION	
Parameter	Data
Chemical concentration:	Testing: 5%Cleaning: 15%Solvent Coating: 50%Research: 10%Chemical Manufacturing: 98%

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	Low	Report is based on data that 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	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability is addressed by comparing concentrations for different processes but uncertainty is not addressed.

Overall Quality Determination	Medium
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Study Citation:	U.S. EPA, (1995). National primary drinking water regulations: 1,1,2-Trichloroethane.			
HERO ID:	7307015			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	124 million lbs produced in 1974.			
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 that 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	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. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	7315820
Conditions of Use:	Adhesives and sealants

EXTRACTION

Parameter	Data
Process description:	Solvent base surface coating is conceptually a simple process. A continuous roll of backing material (called the web) is unrolled, coated, dried, and rolled again. A typical solvent base coating line is shown in Figure 4.2.2.9-1. Large lines in this industry have typical web widths of 152 centimeters (60 in.), while small lines are generally 48 centimeters (24 in.). Line speeds vary substantially, from 3 to 305 meters per minute (10 to 1000 ft/min). To initiate the coating process the continuous web material is unwound from its roll. It travels to a coating head, where the solvent base coating formulation is applied. These formulations have specified levels of solvent and coating solids by weight. Solvent base adhesive formulations contain approximately 67 weight percent solvent and 33 weight percent coating solids. Solvent base releases average about 95 weight percent solvent and 5 weight percent coating solids. Solvents used include toluene, xylene, heptane, hexane, and methyl ethyl ketone. The coating solids portion of the formulations consists of elastomers (natural rubber, styrene-butadiene rubber, polyacrylates), tackifying resins (polyterpenes, rosins, petroleum hydrocarbon resins, asphalts), plasticizers (phthalate esters, polybutenes, mineral oil), and fillers (zinc oxide, silica, clay). The order of application is generally release coat, primer coat (if any), and adhesive coat. A web must always have a release coat before the adhesive can be applied. Primer coats are not required on all products, generally being applied to improve the performance of the adhesive.
Comments:	See document 4.2.2.9.Figure 4.2.2.9-1. Diagram of a pressure sensitive tape and label coating line.

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 adhesives and sealants, an in-scope occupational scenario; however, the data are not specific to this chemical.
	Metric 4: Temporal Representativeness	Low	Report is based on data that are greater than 20 years old.
	Metric 5: Sample Size	N/A	N/A - Process description info.
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	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Most 1,1,2-trichloroethane is made by chlorination of EDC. The reaction is carried out in the liquid phase at 120°C and 345 kPa. The major products are hydrogen chloride (HCl) and 1,1,2-trichloroethane. Where 1,1,2-trichloroethane is made by oxychlorination the reactants are EDC, HCl, and oxygen. Reaction conditions vary from one process to another. Water and 1,1,2-trichloroethane are the major products of this reaction. ³¹ After 1,1,2-trichloroethane is produced, it is dehydrochlorinated with aqueous sodium hydroxide at about 70°C. Major products of the reaction are vinylidene chloride, sodium chloride, and water. A process diagram can be found on PDF Pg. 57.			
Number of sites:	2 sites listed in Table 7.			
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 that are greater than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - Process description info.	
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	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

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: 37 sites reported to 2020 TRI 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	Data are for Disposal which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Vinyl Institute, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.
HERO ID:	11927540
Conditions of Use:	Manufacturing as a Byproduct

EXTRACTION	
Parameter	Data
Process description:	As VI previously explained, impurities are contained in mixed chlorinated organics unintentionally produced during the catalytic oxychlorination of ethylene to make EDC, the raw material precursor for conversion by thermal cracking into vinyl chloride monomer (VCM). The EDC and VCM manufacturing processes often take place in integrated facilities that include direct chlorination of ethylene and, when combined, are known in the industry as “the balanced process.”
Chemical concentration:	See Table 1 for concentrations of 1,1,2-TCA in in light/heavy streams, in addition to composition in EDC and VCM product.
Comments:	Source is related to the unintentional manufacturing of 1,1,2-TCA during the manufacture of 1,2-DCA.

		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	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	Low	Variability and uncertainty are not addressed.

Overall Quality Determination	High
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