United States
Environmental Protection Agency

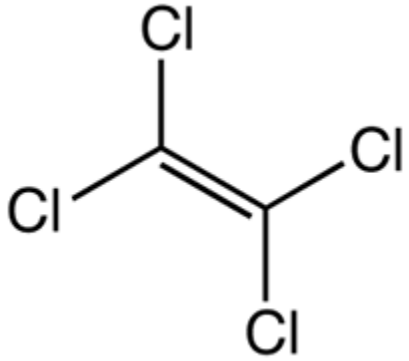
Office of Chemical Safety and
Pollution Prevention

Final Risk Evaluation for Perchloroethylene

Systematic Review Supplemental File:

Data Quality Evaluation of Environmental Release and Occupational Exposure

CASRN: 127-18-4



December 2020

This document is a compilation of tables for the data extraction and evaluation for Perchloroethylene (Ethene, 1,1,2,2-Tetrachloro). Each table shows the data point or set or information element that was extracted and evaluated from a data source in accordance with Appendix D of the Application of Systematic Review in TSCA Risk Evaluations. If the source contains more than one data set or information element, the review provides an overall confidence score for each data set or information element that is found in the source. Therefore, it is possible that a source may have more than one overall quality/ confidence score.

Explanatory Notes

These explanatory notes provide context to understand the short comments in the data evaluation tables.

Domain	Metric	Description of Comments Field
Reliability	Methodology	Indicates the sampling/analytical methodology, estimation method, or type of publication
Representativeness	Geographic Scope	Indicates the country of the study, publication, or underlying data
	Applicability	Indicates whether the data are for a condition of use within scope of the Risk Evaluation
	Temporal Representativeness	Provides the year of study, publication, or underlying data
	Sample Size	Describes the distribution of the sample or underlying data
Accessibility / Clarity	Metadata Completeness	Describes the completeness of the metadata
Variability and Uncertainty	Metadata Completeness	Indicates if study or publication addresses variability and uncertainty of the data or information

Releases to the Environment

Source Citation:	Hellweg, S.,Demou, E.,Scheringer, M.,McKone, T. E.,Hungerbuhler, K.. 2005. Confronting workplace exposure to chemicals with LCA: examples of trichloroethylene and perchloroethylene in metal degreasing and dry cleaning. Environmental Science and Technology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	88147

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor degreasing and dry cleaning
Release Source:	Total from open baths, leaks, residual PCE on materials, and from loading/ unloading machine
Environmental Media:	Air
Release or Emission Factor:	Degreasing: 0.051-48 g/m2 metal surface treated (range for type 1 through type 5 machines)Dry Cleaning: 0.35-95 g/kg garmnet treated (range for 1st through 5th gen machines)Supporting information (not included in main reference) provide individual data points
Release Estimation Method:	Measured

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from US and Switzerland (OECD Country)
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for only for air releases which are not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 10 years old (2005), includes emission rates for various machine types
	Metric 5:	Sample Size	High	× 1	1	Range and averages provided for each machine type, individual data points available in supporting information
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Contains all information expect release frequency
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability between machine types discussed

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Source Citation:	Hellweg, S.,Demou, E.,Scheringer, M.,McKone, T. E.,Hungerbuhler, K.. 2005. Confronting workplace exposure to chemicals with LCA: examples of trichloroethylene and perchloroethylene in metal degreasing and dry cleaning. Environmental Science and Technology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	88147

EVALUATION

Domain	Metric	Rating	MWF[⋆]	Score	Comments
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.4.

[⋆⋆] Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

[⋆] MWF = Metric Weighting Factor

[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Raisanen, J.,Niemela, R.,Rosenberg, C.. 2001. Tetrachloroethylene emissions and exposure in dry cleaning. Journal of the Air and Waste Management Association.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	671474

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Release Source:	Evapoartion from machines
Environmental Media:	Air
Release or Emission Factor:	0.3-3/6 g/kg clothes

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Described, emission rate based on measured concentration and air flow rate
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Finland (OECD country)
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for only for air releases which are not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data over 10 years old (2001), but for current machine types
	Metric 5:	Sample Size	Medium	× 1	2	Range given, bsed on shop type (industrial or commercial)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Describes overall emission from machine but not from particular sources/ activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variabi;ity between shop types described
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Raisanen, J.,Niemela, R.,Rosenberg, C.. 2001. Tetrachloroethylene emissions and exposure in dry cleaning. Journal of the Air and Waste Management Association.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	671474

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: $\geq$ 1 to $<$ 1.7; Medium: $\geq$ 1.7 to $<$ 2.3; Low: $\geq$ 2.3 to $\leq$ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing
Life Cycle Description (Subcategory of Use):	Manufacturing
Release Source:	evaporation from manufacture
Environmental Media:	air
Annual Release Quantity (kg/yr):	650.9 (MT/yr)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for only for air releases which are not in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Garetano, G.,Gochfeld, M.. 2000. Factors influencing tetrachloroethylene concentrations in residences above dry-cleaning establishments. Archives of Environmental Health.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	630549

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Release Source:	Air emissions occur during the process i.e., direct process emissions, evaporative losses when clothes are transferred from washer to dryer, fugitive emissions, and accidental spills.
Environmental Media:	air
Release or Emission Factor:	Total release: 46,000 tons/yr
Waste Treatment Method:	EPA designed inspection and maintenance practices to reduce process and fugitive emissions e.g., not opening of machine doors during loading and unloading, improper functioning of the refrigerated condensers, periodic cleaning of lint and button traps, the use of tetrachloroethylene for spot cleaning.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	NIOSH Method 1003
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	New Jersey (Hudson Regional Health Commission)
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2000).
	Metric 5:	Sample Size	Medium	× 1	2	distribution of samples adaquately characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Detailed analysis of residences characteristics and monitoring results
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion of the variability

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Source Citation:	Garetano, G.,Gochfeld, M.. 2000. Factors influencing tetrachloroethylene concentrations in residences above dry-cleaning establishments. Archives of Environmental Health.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	630549

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Environmental Media:	Disposal practices for solid and liquid production wastes vary. One plant reports deep well injection of tetrachloroethylene-bearing sludges.
Release or Emission Factor:	The annual releases are difficult to assess, and widely divergent values have been reported, ranging from a 1ow of 291 - 4,550 MT. Releases during production are airborne emissions, primarily from process vents, distillation vents, and fugitive emissions (pg 32 of 152).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Environmental Media:	air+++++water
Release or Emission Factor:	extimated 121,000 MT of PCE released to the atmosphere; the industry emits roughly one-half of the PCE it uses, mostly in the form of evaporative losses. Levels at the vents are between 6,800 and 680,000 ug/m3++++++++10 MT to sewer systems (table 2; pg 27 of 152).
Waste Treatment Method:	Carbon adsorption systems are being used increasingly to treat waste materials. In the process, solvents are routed through "chillers" to reduce relative temperatures.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	dry cleaning data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	metal degreasing
Environmental Media:	waterTetrachloroethylene is decomposed by contact with hot metals, certain inorganic acids, hot carbon, and certain alkaline metals or compounds of them. Unstabilized tetrachloroethylene can be corrosive to metals; this has obvious implications for the "terminal" disposal of waste solutions and sludges (containing the chemical) in unlined metal drums. TABLE 5. DEGRADATION OF TETRACHLOROETHYLENE UNDER VARIOUS CONDITIONS
Release or Emission Factor:	40 MT to water15-62.5 percent of the solvent consumed results in waste.Data for Tetrachloroethvlene (PCE) concentrations in wastewaters before and after teratment are shown in Table 8. Combined sewage may contain up to 2412 ug/l, although influent levels were typically below 100 ug/l. Effluents were much lower, usually below 5 ug/l, indicating removal efficiencies usually above 90 percent .
Release Estimation Method:	Largest release from cold metal cleaning is waste solvent evaporation. Evaporation from a vapor degreaser is less than from a cold cleaner of similar capacity because vapor degreasing wastes have a higher boiling point, volatilizing less rapidly, and vapor degreasing solvents contain expensive halogens, which are recycled. Distillation is used to recycle wastes in half of open-top vapor degreasers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	degreasing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning - Industrial Plant
Environmental Media:	air
Release or Emission Factor:	Release(see Table 16 for additional details)
Release Estimation Method:	model
Annual Release Quantity (kg/yr):	13,004,483
Release Days per Year:	6
Number of Sites:	270.0

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	dry cleaning data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning - Commercial plant
Environmental Media:	air
Release or Emission Factor:	Release(see Table 16 for additional details); see page 96 of 152 for information on discharges to POTWs.
Release Estimation Method:	model
Annual Release Quantity (kg/yr):	48,262,189
Release Days per Year:	5
Number of Sites:	18750.0

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	dry cleaning data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	metal degreasing
Environmental Media:	water
Release or Emission Factor:	Release(see Table 16 for additional details); see page 96 of 152 for information on discharges to POTWs.
Release Estimation Method:	EXAMS model
Annual Release Quantity (kg/yr):	8.76

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	degreasing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gentner, D. R.,Miller, A. M.,Goldstein, A. H.. 2010. Seasonal variability in anthropogenic halocarbon emissions. Environmental Science and Technology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	1641888

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Annual Release Quantity (kg/yr):	780,000

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	University of California, Berkeley
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	data less than 20 years
	Metric 5:	Sample Size	Low	× 1	3	no statistics available for sources of emissions. Focus is ambient monitroing data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	emission totals; no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	study does not address variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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★ MWF = Metric Weighting Factor

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Source Citation:	U.S, E. P. A.. 2006. Risk assessment for the halogenated solvent cleaning source category.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3044969

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	halogenated solvent cleaning - general
Annual Release Quantity (kg/yr):	2.10E+06

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2005).
	Metric 5:	Sample Size	Medium	× 1	2	Aggregated NEI data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	NEI collects metadata, but it's not included here
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	NEI has information on variability, but its not presented here.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Risk assessment for the halogenated solvent cleaning source category.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3044969

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	halogenated solvent cleaning - air force base
Release or Emission Factor:	Hypothetical compliance data (e.g. appendix A pg 59 of 200: solvent use=8,128.8 kg/yr and PCE baseline release rate=0.24 g/sec and post-MACT estimates for many facilities... technique for estimating post-MACT included on page 105). Also includes NEI release data (e.g., appendix C table C-2 pg 158)
P2 Control & percent Efficiency:	various e.g., increased dwell time + freeboard refrigeration device for existing in-line machines=50 percent (pg 108 and 112 of 200).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2005).
	Metric 5:	Sample Size	High	× 1	1	dozens of individual facility (all hypothetical)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	dozens of individual facility (all hypothetical) PERC emission rates
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.0.

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Source Citation:	U.S, E. P. A.. 2006. Risk assessment for the halogenated solvent cleaning source category.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3044969

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Harley, R. A.,Cass, G. R.. 1994. Modeling the concentrations of gas-phase toxic organic air pollutants: Direct emissions and atmospheric formation. Environmental Science and Technology.
Type of Data Source	Releases to the Environment; Published Models;
Hero ID	665376

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Model based on scientifically sound methods
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Unacceptable	× 2	8	Data looks at ambient air concentrations - air releases not in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	1994
	Metric 5:	Sample Size	N/A		N/A	N/A - model
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	variability and uncertainty discussed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2014. Toxicological profile for tetrachloroethylene (Draft for public comment).
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2990770

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Waste Treatment Method:	One method of disposal involves absorption invermiculite, dry sand, earth, or a similar material and then burial in a secured sanitary landfill. A second method involves incineration after mixing with another combustible fuel, followed by an acid scrubber. Also, potential methods include fluidized bed incineration at 450980"C, rotary kilnincineration at 8201,600"C, and liquid injection incineration at 6501,600"C

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	High	× 1	1	Not necessarily an appropriate metric for type of data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2014. Toxicological profile for tetrachloroethylene (Draft for public comment).
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2990770

EXTRACTION

Parameter	Data
Life Cycle Stage:	Production, Processing, Use
Life Cycle Description (Subcategory of Use):	Processing, Industrial Use
Release Source:	245 domestic manufacturing and processing facilities including Surface water discharges, waste water treatment-(metals only), and publicly owned treatment works
Environmental Media:	water
Annual Release Quantity (kg/yr):	323 pounds in 2011
Waste Treatment Method:	aeration processes, aerobic degradation with white rot fungus

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	High	× 1	1	Not necessarily an appropriate metric for type of data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1980. Waste solvent reclamation.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3840001

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling for industrial reuse
Life Cycle Description (Subcategory of Use):	Industrial pre-treatment
Release Source:	Spillage
Disposal /Treatment Method:	Reclamation
Environmental Media:	water (air also included in document)
Release or Emission Factor:	0.20 lb/ton reclaimed solvent
Release Estimation Method:	Data from state air pollution control agencies and sampling

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	References include EPA and industry sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Medium	× 2	4	Data includes reclamation from in-scope uses
	Metric 4:	Temporal Representativeness	Low	× 2	6	References from the 1960s and 1970s
	Metric 5:	Sample Size	Medium	× 1	2	emission factors given as range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1978. Control of volatile organic emissions from perchloroethylene dry cleaning systems.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3860353

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA document
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.7.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

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Source Citation:	2017. Pollution prevention search results, envirofacts database.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3860453

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Processing, Industrial Use
Release Source:	Various
P2 Control & percent Efficiency:	Improved procedures for loading, unloading, transfer. Improved maintenance, recordkeeping, procedures.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA Envirofacts Database
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	appears to cover uses that would be in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Releases include years as recent as 2015
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Does not indicate release media or other metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.8.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

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Source Citation:	U.S, E. P. A.. 1995. Guidance document for the halogenated solvent cleaner NESHAP.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3827323

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Batch vapor degreaser (e.g., open-top, closed-loop); In-line vapor degreaser (e.g., conveyorized, web cleaner)
Release Source:	Vapor machine heats solvent enough to create vapor.Cold machine does not heat the solvent enough to create vapor (e.g., carburetor cleaning machine).
Environmental Media:	air
Release or Emission Factor:	NESHAP emission limits: idling=0.045 lbs/hr/ft2 of solvent-air interface area (EPA Test Method 307);carbon adsorber and lip exhaust=100 ppm (pg 34 of 190)batch vapor=30.7 lbs/ft2 x month, 3-month averagenew in-line=31.4 lbs/ft2 x month, 3-month averageexisting in-line=30.7 lbs/ft2 x month, 3-month average (pg 50 of 190)EMISSION LIMITS FOR CLEANING MACHINES WITHOUT A SOLVENT-AIR INTERFACE (pg 103 of 190)Lip exhaust control (can increases overall solvent emissions to the air)
Waste Treatment Method:	1) cover or reduce room draft, 2) automated parts handling e.g., control dwell time, 4) purchase equipment with 1.0 freeboard ratio i.e., height divided by smallest interior width, 5) refrigerate freeboard, 6) superheated vapor, 7) work practices
P2 Control & percent Efficiency:	Solvent Alternatives GuidE (SAGE) is an interactive database developed by the EPA that can provide you a list of candidate replacements for your current solvent.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1995)
	Metric 5:	Sample Size	Low	× 1	3	emission limits not actual release data

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Source Citation:	U.S, E. P. A.. 1995. Guidance document for the halogenated solvent cleaner NESHAP.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3827323

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	Distribution if emission is not characterized with statistics. It is assumed that facilities will comply with emission limits.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.8.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	A typical new fourth generation machine can clean 800 pounds of garments per gallon of PCE.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2006)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Waste Treatment Method:	1) carbon absorbers as the main PERC vapor recovery system 2) refrigerated condensers 3) To reduce the amount of PERC emissions to the air, all PERC dry cleaners must conduct a leak detection and repair program on a regular basis

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	New Mexico Environment Departemnt
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated (e.g., NESHAP, RCRA)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	waste
Release or Emission Factor:	Any waste that is contaminated with PERC, such as the button trap, lint screen, still bottom residue, spent filter cartridges, filter muck, process water, carbon filters, and/or cooked powder residue is considered a hazardous waste as well as any unused PERC that is to be disposed.facility is classified as either a Conditionally Exempt Small Quantity Generator (CESQG), a Small Quantity Generator (SQG), or a Large Quantity Generator (LCG) based on the amount of hazardous waste they generate on a monthly basis... SQGs and LQGs are required to send their hazardous waste to an RCRA-permitted facility. Unless subject to stricter state requirements, CESQGs may send their hazardous waste to a state approved solid waste facility (municipal landfill) or to a RCRA permitted facility.
P2 Control & percent Efficiency:	all hazardous waste must be kept in a leak-proof, tightly covered container.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	New Mexico Environment Departemnt
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	dry cleaning in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated (e.g., NESHAP, RCRA)
Domain 4: Variability and Uncertainty						

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Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986890

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	water
Release or Emission Factor:	Any water, regardless of how it became contaminated, that contains more than 0.7 ppm (parts per million) of PERC is considered hazardous waste and must be dealt with according to RCRA regulations. Placing PERC-contaminated wastewater directly onto or into the ground (e.g. septic systems, underground injection well, etc.) is prohibited.++++++++++++Separator water, which typically contains 150 ppm of PERC, is by definition a hazardous material. There are two options available to deal with this waste water:
Waste Treatment Method:	Treatment can be accomplished by passing the separator water through two granular activated carbon units in series prior to evaporation. The activated carbon units must be operated and maintained so that the separator water never exceeds 0.7 ppm PERC concentration.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	New Mexico Environment Departemnt
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	dry cleaning in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated (e.g., NESHAP, RCRA)
Domain 4: Variability and Uncertainty						

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Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986890

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		High		1.3	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Wu, C. Y.,Biewen, T. J.,Nelson, C.. 1996. Analysis of emission sources for air toxic pollutants.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982593

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release or Emission Factor:	There are different levels of source activity data available for different categories of area sources" For example, county total perchloroethylene consumption values were calculated for all dry-to-dry machines with control, all dry-to-dry machines without control, all transfer machines with control, and all transfer machines without control, using perchloroethylene consumption data from each individual dry cleaner within the county.
Annual Release Quantity (kg/yr):	Emissions from the state of Minnesota in 1996:point sources: 160,841 lbs/yr (72,957 kg/yr)area sources: 691,412 (313,620 kg/yr)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Source describes mutliple methods for obtaining data but does not state the which method(s) were used to obtain the presented data.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air emissions are out of scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1996)
	Metric 5:	Sample Size	Medium	× 1	2	statistical representativeness is unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	release mediagiven but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability or uncertainty in submitter provided data.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.9.

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Source Citation:	Wu, C. Y.,Biewen, T. J.,Nelson, C.. 1996. Analysis of emission sources for air toxic pollutants.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982593

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	use
Life Cycle Description (Subcategory of Use):	dry cleaning
Environmental Media:	air
Release or Emission Factor:	Wolf and Myers (1987) estimated that 0.88 pounds of perchloroethylene were emitted for each pound used in dry cleaning by subtracting the amount of waste generated in 1984 from the total amount of perchloroethylene used that year.++++++++++++++In addition, two industrial trends should result in declining emissions: the trend toward use of dry-to-dry rather than transfer equipment and the increasing use of soap and water solutions instead of perchloroethylene by large industrial cleaners (Devries, 1986; Lauman, 1986; Wolf, 1986)
Waste Treatment Method:	In order to control perchloroethylene as an ozone-precursor, about 25 percent of California's air pollution control districts have adopted control measures specifying the installation of emission reduction devices (e.g., carbon adsorbers or refrigerated condensers) at larger dry cleaning facilities.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.5.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	manufacturer
Life Cycle Description (Subcategory of Use):	Manufacture
Environmental Media:	air
Release or Emission Factor:	Based on independent estimates by the EPA and a private contractor, total annual emissions from this producer ranged from approximately 15 to 65 tons per year (TPY) (CMR, 1986; U. S. EPA, 1985). According to a company spokesman, this facility has ceased perchloroethylene production (Andersen, 1991).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.5.

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

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Source Citation:	Cis,. 1997. Clearing the air on clean air: Strategies for perc dry cleaners compliance, risk reduction, pollution prevention.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982315

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Release Source:	Dry-to-dry machine
Release or Emission Factor:	8.8 lbs perc/100 lbs clothes (vented)5.7 lbs perc/100 lbs clothes (unvented)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	1997
	Metric 5:	Sample Size	High	× 1	1	Disrete emission factors provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Includes necessary metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ecb,. 2005. European Union risk assessment report: Tetrachloroethylene. Part 1 - Environment.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3839195

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture/Intermediate
Life Cycle Description (Subcategory of Use):	Domestic manufacture (Europe)/Intermediate
Release Source:	Waste water
Environmental Media:	water
Release or Emission Factor:	Fraction released to water during manufacture: 0.003Fraction released to water during use as intermediate: 0.007
Release Days per Year:	300
Number of Sites:	5.0

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	European Chemicals Bureau
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2005
	Metric 5:	Sample Size	High	× 1	1	Sample size small, but outlined clearly
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Includes most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ecb,. 2005. European Union risk assessment report: Tetrachloroethylene. Part 1 - Environment.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3839195

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Release Source:	Waste water from closed system
Environmental Media:	water

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	European Chemicals Bureau
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2005
	Metric 5:	Sample Size	High	× 1	1	Sample size small, but outlined clearly
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Includes most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment); Batch vapor degreaser (e.g., open-top, closed-loop); In-line vapor degreaser (e.g., conveyorized, web cleaner)
Environmental Media:	air
Release or Emission Factor:	Most perchloroethylene emissions attributed to degreasing result from solvent vapor escaping the tank by diffusion and convection and from solvent being carried out on cleaned parts. Other emissions result from handling, equipment and storage leaks, and disposal. The amount of perchloroethylene emissions from different degreasing operations varies with equipment and manner of operation. Open-top vapor degreasers are expected to emit more perchloroethylene than other types of degreasing units. Equipment may be added to reduce emissions, for example, freeboard chillers reduce diffusion and convection of solvent vapors and carbon adsorbers recover solvent vapors.++++++++++++The EPA used a materials balance approach to estimate that 0.92 pounds of perchloroethylene were emitted for every pound used in degreasing.
Waste Treatment Method:	Operating practices that reduce emissions include: keeping tanks covered. increasing freeboard area (the distance between the top of the degreaser and the solvent level), removing parts slowly, thoroughly draining parts on racks, and checking for leaks (ARB. 1989b).

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US
Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.5.

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Publicly owned treatment works (POTW)
Environmental Media:	air
Release or Emission Factor:	Chang, et a1. (1987) used plant influent and effluent concentrations and flows to estimate POTW emissions. Assuming that no losses other than volatilization from plants occur, Chang, et al. estimate that approximately 50 TPY of perchloroethylene are emitted from California POTWs.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.5.

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Municipal landfill
Environmental Media:	air
Release or Emission Factor:	The data showed perchloroethylene concentrations ranging from the detection limit (see Appendix C) of 10 ppbv to 45,000 ppbv in the internal gas of 241 out of the 340 landfills at which internal gas testing was conducted.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.5.

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Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Environmental Media:	air
Release or Emission Factor:	Manufacture = 0.09 kg/metric ton quantity handledRaw material=0.0003 kg/metric ton quantity handledStorage=0.086 kg/metric ton quantity handledSolvent=643 kg/metric ton quantity handledCleaning=790 kg/metric ton quantity handled

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Government of Japan - Ministry of the Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Japan is an OECD country
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)"comissioned by Environment Agency in 1996"
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.8.

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Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

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Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	solid waste
Release or Emission Factor:	Residue (mass) per annual cleaning load (kg of distillation sludge per kg of tetrachloroethylene raw material used):Spin disc filter=0.008Diatomaceous earth filter=0.008Cartridgetype filter=0.004

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Government of Japan - Ministry of the Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Japan is an OECD country
	Metric 3:	Applicability	High	× 2	2	in scope uses
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		2.1	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Spot cleaner
Environmental Media:	air
Release or Emission Factor:	Activated carbon adsorption quantity of specified substance in detergent (g/kg-activated carbon): (a) If ambient concentration 392 ppm, then adsorption equilibrium concentration is 10 ppm, (b) If ambient concentration 547 ppm, then adsorption equilibrium concentration is 100 ppm, (c) If ambient concentration 694 ppm, then adsorption equilibrium concentration is 1000 ppm.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Government of Japan - Ministry of the Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Japan is an OECD country
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)"Japan Industrial Conference on Cleaning (January 2001)"
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.5.

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Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: Part II materials.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986511

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Foundry applications
Environmental Media:	liquid waste
Release or Emission Factor:	Content of chlorinated organic solvent in waste oil (ratio of degreasing/washing agent): (a) With a solvent recovery device=0.40, (b) Without a solvent recovery device=0.75

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Government of Japan - Ministry of the Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Japan is an OECD country
	Metric 3:	Applicability	High	× 2	2	in scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. Toutes les substances: "missions pour l' ann"e 2012 and pr"visions pour l'ann"e 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986546

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Paint and coating products
Environmental Media:	air
Release or Emission Factor:	2012 actual=0 metric tons2015 forecasts=0 metric tonsCanada Colors and Chemicals Limited manufactures and distributes commodity and specialty chemicals to businesses in industrial and solvent sector, food and fine chemicals, coatings and polymer additives, oil and gas, soap and detergent, mining, pulp and paper, environmental, and water treatment markets in North America. It sells a range of commodity and specialty chemical products and solutions, including acids, alkalis, borates, carbonates, citrates, nitrates, oxides, phosphates, silicates, silicones, sulphates, and a multitude of other chemistries used in various industrial and process applications; and coatings for architectural, automotive, construction, industrial, maintenance...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. Toutes les substances: "missions pour l' ann"e 2012 and pr"visions pour l'ann"e 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986546

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. Toutes les substances: "missions pour l' ann"e 2012 and pr"visions pour l'ann"e 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986546

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Other chemical products and preparations
Environmental Media:	air
Release or Emission Factor:	2012 actual=0.21 metric tons2015 forecasts=0.20 metric tonsE.I. du Pont Canada Company develops, manufactures, and distributes herbicides, refrigerants, additives, and other related solutions. It offers chemicals in the areas of additives and modifiers, animal nutrition and disease prevention solutions, apparel and textile solutions, construction materials, consulting services and process technologies, crop protection solutions, dietary supplement ingredients, display and lighting materials, electronic and electrical materials, fabrics, fibers and nonwovens, food ingredients, and food protection solutions, as well as composites, interlayers, and laminates. The company also provides products in the areas of home care, garden and car care, industrial ...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. Toutes les substances: "missions pour l' ann"e 2012 and pr"visions pour l'ann"e 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3986546

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Japanese Ministry of, Environment. 2004. Manual for PRTR release estimation models: 1. Examples of calculation in typical processes.
Type of Data Source	Releases to the Environment; published models;
Hero ID	3986517

EXTRACTION

Parameter	Data
Life Cycle Stage:	use
Life Cycle Description (Subcategory of Use):	dry cleaning
Environmental Media:	Air

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methods are free of error but choice of parameters is not clear
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan is an OECD country
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data older than 10 years
	Metric 5:	Sample Size	N/A		N/A	N/A - model
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	no documentation of parameters
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.9.

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2012 and projections for 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982361

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Paint and coating products
Environmental Media:	air
Release or Emission Factor:	2012 actual=0 metric tons2015 forecasts=0 metric tonsCanada Colors and Chemicals Limited manufactures and distributes commodity and specialty chemicals to businesses in industrial and solvent sector, food and fine chemicals, coatings and polymer additives, oil and gas, soap and detergent, mining, pulp and paper, environmental, and water treatment markets in North America. It sells a range of commodity and specialty chemical products and solutions, including acids, alkalis, borates, carbonates, citrates, nitrates, oxides, phosphates, silicates, silicones, sulphates, and a multitude of other chemistries used in various industrial and process applications; and coatings for architectural, automotive, construction, industrial, maintenance...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2012 and projections for 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982361

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2012 and projections for 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982361

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Other chemical products and preparations
Environmental Media:	air
Release or Emission Factor:	2012 actual=0.21 metric tons2015 forecasts=0.20 metric tonsE.I. du Pont Canada Company develops, manufactures, and distributes herbicides, refrigerants, additives, and other related solutions. It offers chemicals in the areas of additives and modifiers, animal nutrition and disease prevention solutions, apparel and textile solutions, construction materials, consulting services and process technologies, crop protection solutions, dietary supplement ingredients, display and lighting materials, electronic and electrical materials, fabrics, fibers and nonwovens, food ingredients, and food protection solutions, as well as composites, interlayers, and laminates. The company also provides products in the areas of home care, garden and car care, industrial ...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2012 and projections for 2015.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982361

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2011 and projections for 2014.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982362

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Paint and coating products
Environmental Media:	air
Release or Emission Factor:	2011 actual=0 metric tons2014 forecasts=0 metric tonsCanada Colors and Chemicals Limited manufactures and distributes commodity and specialty chemicals to businesses in industrial and solvent sector, food and fine chemicals, coatings and polymer additives, oil and gas, soap and detergent, mining, pulp and paper, environmental, and water treatment markets in North America. It sells a range of commodity and specialty chemical products and solutions, including acids, alkalis, borates, carbonates, citrates, nitrates, oxides, phosphates, silicates, silicones, sulphates, and a multitude of other chemistries used in various industrial and process applications; and coatings for architectural, automotive, construction, industrial, maintenance...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2011)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2011 and projections for 2014.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982362

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2011 and projections for 2014.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982362

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Other chemical products and preparations
Environmental Media:	air
Release or Emission Factor:	2011 actual=0.22 metric tons2014 forecasts=0.01 metric tonsE.I. du Pont Canada Company develops, manufactures, and distributes herbicides, refrigerants, additives, and other related solutions. It offers chemicals in the areas of additives and modifiers, animal nutrition and disease prevention solutions, apparel and textile solutions, construction materials, consulting services and process technologies, crop protection solutions, dietary supplement ingredients, display and lighting materials, electronic and electrical materials, fabrics, fibers and nonwovens, food ingredients, and food protection solutions, as well as composites, interlayers, and laminates. The company also provides products in the areas of home care, garden and car care, industrial ...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Chemistry Industry Association of Canada; declarations by company, plant and substance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2011)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Chemistry Industry Association of, Canada. 2017. All substances emissions for 2011 and projections for 2014.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982362

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Arb,. 1991. Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982312

EXTRACTION

Parameter	Data
Life Cycle Stage:	A) ManufactureB) Commercial/consumer useC) ProcessingD) Distribution in commerce
Life Cycle Description (Subcategory of Use):	A) Domestic manufactureB) Dry cleaning solvent; Cleaners and degreasers (other)C) Paint and coating products; Adhesive and sealant products; RecyclingD) Distribution
Environmental Media:	Air
Release or Emission Factor:	Table 1 shows that approximately 80 percent of perchloroethylene emissions result from the use of the solvent in dry cleaning and decreasing operations"Production=15-65 tons/yearDry Cleaning=11,000 tons/yearDegreasing=3,000 tons/yearPaints, Coatings=1,300 tons/yearAdhesives=340 tons/yearMiscellaneous=1,600 tons/yearDistribution=5 tons/yearSolvent Reclamation=5-20 tons/yearPOTWs=50 tons/year

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	US, but some totals are regional.
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Arb,. 1991. Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982312

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Overall Quality Determination†	Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	In-line vapor degreaser (e.g., conveyorized, web cleaner)
Release or Emission Factor:	Typically these degreasers perform the cleaning operation in a sealed chamber into which solvent is introduced after the chamber is closed. Solvent vapor then performs the fi nal drying stage, and all vapors are exhausted after each cycle and passed into a solvent recovery system. With the sealed chamber, control of solvent loss exceeds 90 percent.++++++++++++++++Results of Life Cycle Assessment (e.g., solid waste) for multiple scenarios including: open-top degreaser without NESHAP-compliant controls (VD1).
Waste Treatment Method:	...some companies have found it cost effective to install one of the advanced types of degreasers that have no air/vapor interface. These sealed units were first introduced in Europe, but have become available in the United States in recent years.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						

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Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Batch vapor degreaser (e.g., open-top, closed-loop)
Release or Emission Factor:	In an open-top degreaser, although the vapor generally stays below the primary condensing coils, there can still be considerable solvent loss. Drafts in the work area cause solvent vapor to be pulled out. Parts loading disturbs the solvent/air interface and causes losses. In addition, cleaned parts may carry solvent with them when removed from the degreaser. These factors can cause an uncontrolled open-top degreaser to lose up to 70 percent of the solvent over a year. Consequently, procedures are necessary to minimize this loss to ensure compliance with environmental and occupational requirements.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

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Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Cleaners and degreasers (other)
Release or Emission Factor:	Recent amendments to the NESHAP also imposed facility-wide emission limits on companies that vapor degrease with the chlorinated solvents. The annual limits, including emissions from all the degreasing units at a facility 4,800 kg (10,500 lbs) for PERC.
Waste Treatment Method:	Companies operating batch or in-line degreasers are given three options for compliance: 1) Installing one of several combinations of emission control equipment and implementing automated parts handling and specified work practices; 2) Meeting an idling-mode emission limit, in conjunction with parts handling and work practice requirements; or 3) Meeting a limit on total emissions.++++++++++++When a company chooses the equipment option to comply with the NESHAP, it may choose from a series of combinations of two or three procedures, which include...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.

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Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982144

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	A) Commercial/consumer useB) Processing
Life Cycle Description (Subcategory of Use):	A) Dry cleaning solvent; Cleaners and degreasers (other)B) Intermediate in basic organic chemical manufacturing; Recycling
Environmental Media:	water
Release or Emission Factor:	The U.S. EPA TRI reported less than 12 pounds of PCE released to water for each of the years from 1987 to 1994 (U.S. EPA, 1994b).
Waste Treatment Method:	Trace amounts of PCE may also be formed during the disinfection of water through chlorination (NAS, 1977).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Jordan, G. R.. 1985. Solvent recovery in the dry cleaning industry.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982087

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release or Emission Factor:	In the United States, 50 percent of drycleaners use perchloroethylene (perc) as the cleaning solvent, while the remaining establishments utilize Stoddard solvents (petroleum distillates) or fluorocarbons.++++++++++++++++One of the most common sources of solvent loss is in the filter sludge, also known as filter muck. Even after 24 hours of drainage, filter sludge contains as much as 75 percent perc, or about three pounds of solvent per pound of filter powder. Cooking solvents out of regenerable filter materials in a muck cooker can reduce the amount of solvent lost in filter material by 89 percent .++++++++++++++++Residues in the botton of distillation units are also rich in solvents. Proper distillation can reduce solvent content in the still bottoms to less than 60 percent by weight. Perc content in still bottoms can be reduced to 1 percent through use of oil cookers.++++++++++++++++The Northeast Fabricare Association (NEFA), an industy association, offers over 2,500 drycleaners a creative, coordinated waste hauling service to help them comply with environmental law at an affordable rate.
Waste Treatment Method:	Most perc plants use a reclaiming dryer which permits recovery of solvent during drying. However, during deodorizing, solvent-laden air is exhausted. directly to the ambient air. Carbon absorption (CA) and refrigeration/condensation (R/C) will control these losses and facilitate recovery... CA can remove more than 96 percent of the solvent in the exhaust system otherwise ventilated to the outside... Refrigeration/Condensation Technique: stripped air is returned to the dry cleaning machine, eliminating the need for external venting ducts.
P2 Control & percent Efficiency:	Good housekeeping practices to limit fugitive emissions are an integral part of minimizing pollution as well as enhancing company profits. These practices include: 1) ensurance of gasket integrity on dryer doors * minimizing solvent retention in garment during unloading, 2) periodic replacement of seals on dryer deoderizing and aeration valves, 3) repairing holes in air and exhaust ducts, 4) closing solvent containers when not in use

EVALUATION

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Source Citation:	Jordan, G. R.. 1985. Solvent recovery in the dry cleaning industry.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982087

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.The identified author is "Gregory R. Jordan, Department of Environmental Management, Bureau of Solid Waste Disposal"
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	× 2	6	Data over 20 years old (1985)
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982088

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	solid waste
Release or Emission Factor:	Approximately 85 percent of cleaners use perc as their primary solvent.
Waste Treatment Method:	Used solvent is distilled so it can be purified. Distillation separates the solvent from waste residues such as detergents, dye, dirt, oil, so the solvent can be reused. In addition to distillation, most machines also use filters to clean used solvent" After the purification process, filters that contain the solvent in very small amounts, and certain solvent residues, such as perc, must be managed and disposed of as hazardous waste. Drycleaners can send them to special facilities for recycling or incineration.
P2 Control & percent Efficiency:	There are a number of new processes at different stages of development, such as: 1) Cleaning processes based on liquid carbon dioxide are being tested and show promise as environmentally sound cleaning systems. 2) A process based on glycol ethers. 3) A water-based process using ultrasonic energy.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA Office of Pollution Prevention and Toxics
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1998)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.

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Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982088

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	waste water
Waste Treatment Method:	At the end of the cleaning process, the cleaning fluid is separated from waste water by distillation. In the past, the waste water was often poured down floor drains. In newer equipment, the waste water is collected and evaporated or removed by hazardous waste handlers and disposed of through EPA-approved methods.+++++++++Perc can seep through the ground and contaminate surface water, groundwater, and potentially drinking water. A small amount of perc can contaminate a large amount of water and people can be exposed by drinking or using the water. EPA has a limit on the amount of perc that is allowed to be in drinking water.
P2 Control & percent Efficiency:	Driven by concerns about perc and other drycleaning solvents, recent advances in both technology and garment care have resulted in a sophisticated machine-based process called "wetcleaning" which uses water as the solvent. Wetcleaning is done in specially-designed machines that have to be operated by garment care professionals...Wetcleaning is appealing from an environmental point of view because the cleaning process is done in a solution of water with a few percent of additives.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA Office of Pollution Prevention and Toxics
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1998)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)

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Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	Fig 1. Emission Factors for Dry Cleaning Machines (Pounds of Perc Per 100 Pounds of Clothes) e.g., transfer machine losses a total of 12.2 pounds of PERC per 100 pounds of clothes++++++++++Emissions are a function of PERC consumption Table 1 (i.e., Determining Your Source Category) outlines the NESHAP source categories (i.e., small, large, major source).++++++++++Purchase a halogenated hydrocarbon detector to monitor vapor losses. Up to 25 percent of solvent emissions can be attributed to equipment leaks.
Waste Treatment Method:	...only 62 percent of commercial dry cleaning machines currently have emission control equipment.+++++++Dry cleaners can control process vent emissions with refrigerated condensers or carbon adsorbers. Room enclosures control most fugitive emissions, including those during clothing transfer. Leak detection and repair, good housekeeping, and preventive maintenance also control fugitive emissions.
P2 Control & percent Efficiency:	Initial policy deployment by management provides information on better maintenance practices (BMPs) and monitoring. " Replace the seals regularly on the dryer deodorizer and aeration valves".

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Tennessee Department of Environment and Conservation & University of Tennessee Center for Industrial Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1997)

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Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release Source:	Fig. 2 [Diagram of] Typical Atmospheric and Waste Losses
Environmental Media:	solid waste
Release or Emission Factor:	There are many ways to lose perc in dry cleaning operations process vent and fugitive emissions to the atmosphere and losses in wastes like muck and still bottoms.++++++++++++++Cartridge filters with carbon-cores are the most common type of filter used in dry cleaning...Drain cartridges for a minimum of 24 hours in a closed container. Undrained cartridges may contain as much as one gallon (13 pounds) of solvent.
Waste Treatment Method:	Good operational control for waste reduction is defined as a procedure or policy in an organization that reduces the generation of multi-media wastes... Proper procedures to reduce waste are part of the overall operating plan for a business. " Avoid underloading or overloading of machines. " Place saturated lint from lint baskets in sealed waste containers. " Inspect waste storage containers for leaks.
P2 Control & percent Efficiency:	Pollution prevention (P2) or source reduction involves reducing the amount of waste exiting a process such as dry cleaning. Source reduction includes: " Process or procedure modifications; " Equipment or technology modifications; " Substitution of raw materials or improvements in feedstock purity; " Reformulation or redesign of products; " Improvements in housekeeping, maintenance, training, or inventory control; and " Recycling within a process such as the close-looped distillation of perc.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Tennessee Department of Environment and Conservation & University of Tennessee Center for Industrial Services
Domain 2: Representative					

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Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1997)
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	water
Release or Emission Factor:	Perc is not very soluble in water. Nevertheless, process wastewater will contain about 150 ppm (0.015 percent) solvent. Dry cleaning establishments that launder industrial rags (shop towels), garments, and other textiles have significant levels of perc in the wastewater. In addition, the recovery of perc from vapors routed to water separators from condensers, carbon adsorbers, cartridge strippers, stills, and muck cookers can yield water-contaminated solvent.Routing solvents to a water separator will allow recovery of the heavier solvent. The solvent is ultimately returned to the tank. Drained water from the top of the separator may be passed through one or more carbon filters to reduce perc levels before discharge to the sewer.
Waste Treatment Method:	Consider buying separator water evaporators that are exempt from RCRA permitting. These units have filters designed to yield perc-free water that eventually evaporates from the unit.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Tennessee Department of Environment and Conservation & University of Tennessee Center for Industrial Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1997)
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						

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Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982090

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982092

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	hazardous waste
Release or Emission Factor:	Perchloroethylene plants potentially produce three types of hazardous wastes: 1) still residues from solvent distillation 2) spent filter cartridges, 3) cooked powder residue (drained powder residues from diatomaceous or other powder filter systems after heating to remove excess solvent)Generally there are three methods for proper disposal of hazardous wastes that are currently considered acceptable by both EPA and most State hazardous waste management agencies: 1) disposal in an authorized hazardous waste landfill 2) disposal at an authorized high-temperature incineration facility 3) disposal through an authorized recycler of hazardous wastes

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Prepared by "EMPE, Inc. Consulting Engineers" for the Tennessee Department of Economic and Community Development
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1986)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						

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Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982092

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982092

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	waste water++++++++++++hazardous waste
Release or Emission Factor:	CASE HISTORY: White Way Cleaners, Nashville, TNWhite Way's operation currently consists of dry cleaning (950 - 1200 lbs/day) and linen service (900 lbs/day). These operations represent 75 percent and 25 percent of their total business respectively. " The laundry wastewater (effluent) generated at White Way is nonhazardous. This wastewater is generated at a rate of 12,000 gallons per day.++++++++++++++Waste perchloroethylene (still residues, spent filter cartridges)=7968 kg/yr (DESTINATION: Incineration)
Waste Treatment Method:	The carbon adsorption technology is the most popular solvent recovery technology used in the dry cleaning industry. Adsorption processes help purify liquids and gases by attracting and holding organic impurities on the vast surface area of the adsorbent...Some of the potential disadvantages of the carbon adsorption system are listed below:
P2 Control & percent Efficiency:	In White Way's operation the major source of waste is the perc solvent used in the dry-dry and wet-transfer units. These could be replaced by Valclene units, thus decreasing the amount of solvent that needs to be replenished.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	Prepared by "EMPE, Inc. Consulting Engineers" for the Tennessee Department of Economic and Community Development
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US
Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1986)
Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear

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Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982092

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	278 gal./yr. of PERC usage (1997 North Carolina average) is about 3,767 lbs./yr., BUT less than 30 percent of PERC usages get into the air, or less than 1,200 lbs./ yr.If a single machine uses less than 140 gal/yr, it is exempt from the MACT, but must still keep certain specified records.+++++++++++++++It is estimated that 80-90 percent of PERC used annually in the US is released into the environment, particularly to the atmosphere (EPA, 1982).
P2 Control & percent Efficiency:	The current reduced solvent usages could be further reduced substantially by the following pollution prevention measures: a. Upgrading PERC processes from Generation 3 machines to Generation 4. b. Installation of solvent recovery dryers and vacuum stills in allpetroleum transfer processes. c. Additional operator training on the most efficient operating procedures of the equipment. d. Increasing the use of wet cleaning significantly, from the current 10 percent level to as high as 70 percent, which would obviously further reduce the usages of the solvents.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	North Carolina Department of Environment and Natural Resources - Division of Pollution Prevention and Environmental Assistance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						

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Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	hazardous waste
Release or Emission Factor:	Two primary sources of liquid wastes containing PERC need to be handled very carefully, namely the separator/contact water and the still residues" Florida has a management practice for handling separator/contact water that permits discard to the sewer if the PERC concentration is below a certain level.++++++++++++++Federal regulations prohibit land disposal of various chlorinated solvent materials that may contain PERC. Any waste material containing PERC must be listed as a hazardous waste unless the waste is shown not to endanger the health of humans or the environment (EPA, 1988). Destruction and removal efficiency of PERC-containing waste must be 99.99 percent .
Waste Treatment Method:	Much of the PERC lost in the processing of clothes is lost in the spent cartridge/ carbon filters and the still residues. Using the new spin disk filters where feasible will reduce these loses.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	North Carolina Department of Environment and Natural Resources - Division of Pollution Prevention and Environmental Assistance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						

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Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	ground water
Release or Emission Factor:	Potential groundwater contamination is also a major concern. Historically, potential groundwater contamination came from three sources: 1) the accidental release of PERC stored on the premises, such as a spill which gets into the ground; 2) the accidental release of PERC during the distillation of dirty PERC, i.e. a boil-over, which could also get into the ground; and 3) condensation of water during the dry cleaning process coming into contact with the PERC during normal cleaning operations, and subsequently discharged to a sewer, a septic system, or to a creek or lake. The majority of the contamination of groundwater probably occurred prior to the development of the environmental regulations.++++++++++The current North Carolina groundwater quality standard for PERC is 0.0007 mg/L, which is also expressed in micrograms as 0.7 mg/L (15A NCAC 2L .0202). This threshold corresponds to a one in one million cancer risk.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	North Carolina Department of Environment and Natural Resources - Division of Pollution Prevention and Environmental Assistance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						

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Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3982095

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2002. Occurrence summary and use support document for the six-year review of national primary drinking water regulations.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3970165

EXTRACTION

Parameter	Data
Life Cycle Stage:	Production, Processing, Use
Life Cycle Description (Subcategory of Use):	Various
Release Source:	Various
Environmental Media:	Air, water, soil
Release or Emission Factor:	In 1999: 1,793 lbs to surface water3,648,732 lbs to air8,897 lbs to underground injection19,885 to land

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	covers in scope uses
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data from 1988-1999 TRI, more recent TRI data available
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness is unclear.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1999. 33/50 Program: The final record.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3970174

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Environmental Media:	surface water
Release or Emission Factor:	1311 lbs in 1996

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1999
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Erg,. 2008. LCI summary for eight coffee packaging systems.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3978169

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Environmental Media:	air
Release or Emission Factor:	Life cycle analysis shows atmospheric emissions of PERC vary depending on the coffee container system (ranging from 1.3E-5 to 5.5E-6 lbs per 100,000 ounces of ground coffee).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology described and expected to be accuratee
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	source from <10 years ago
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Sensativity analysis used to address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.9.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Franklin Associates, Ltd. 2006. Life cycle inventory of polystyrene foam, bleached paperboard, and corrugated paperboard foodservice products.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3978165

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Environmental Media:	air
Release or Emission Factor:	Life cycle analysis shows atmospheric emissions of PERC vary depending on the materials in foodservice products (e.g., hot cup, cold cup, high grade plate, sandwich-size clamshells) and related fuel consumption.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology described and expected to be accuratee
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	source from <10 years ago
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Sensativity analysis used to address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.9.

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Source Citation:	Franklin Associates, Ltd. 2006. Life cycle inventory of polystyrene foam, bleached paperboard, and corrugated paperboard foodservice products.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3978165

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes: Summary.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970190

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release Source:	machine
Environmental Media:	air, water, and haz. waste
Release or Emission Factor:	Figure 5 "Estimated Releases from Perc Model Facilities with Various Machine Types and Emission Controls" for eight machines configurations e.g., dry-to-dry closed-loop with unvented integral secondary carbon control. Perc releases to air, water, and haz. waste (gallons per year).
Release Estimation Method:	releases are from other literatre
Waste Treatment Method:	Section describing the primary fabricare equipment e.g., carbon adsorbers, cartridge filters, muck cookers, water separators.Figure 11: An Overview of Trade-Off Factors for Alternative Cleaning Technologies (i.e., hydrocarbon , wetcleaning)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1998)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes: Summary.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970190

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1978. Control techniques for volatile organic emissions from stationary sources.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	40590

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	Emission sources: 1) Dryer Evaporation After Condenser: 3-6 kg/1000 kg of materials cleaned2) Filter Muck: 1-14 kg/1000 kg of materials cleanedMost plants have a muck cooker by economic necessity. Most of the solvent is cooked from the filter muck, condensed, and recycled. The cooked muck and remaining solvent are stored for later disposal. Solvent that has been filtered must be distilled to remove soluble impurities (fats, oils, greases). Distillation bottoms are also stored for later disposal with the filter muck.
Waste Treatment Method:	Emissions after control (pages 519 and 531 of 518):1) Dryer Evaporation After Condenser - After Carbon Adsorption: 0.3 kg/1000 kg of materials cleaned2) Filter Muck - After Cartridge Filters and Longer Cooking Times: 0.5-1 kg/1000 kg of materials cleaned
P2 Control & percent Efficiency:	Although carbon adsorption units can remove 95-100 percent of the organic input to the bed, reductions in the total solvent emission are only 40-65 percent . Some systems achieve less than 40 percent emission reduction because of poor inlet collection efficiency and an improperly maintained or adjusted carbon adsorber (pg 562 of 580).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1978)
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics

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Source Citation:	U.S, E. P. A.. 1978. Control techniques for volatile organic emissions from stationary sources.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	40590

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

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Source Citation:	U.S, E. P. A.. 1978. Control techniques for volatile organic emissions from stationary sources.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	40590

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	water and solid waste
Release or Emission Factor:	Carbon adsorption will increase water use; Perc released in wastewater characterized... Disposal of spent carbon from carbon adsorption systems creates a negligible solid waste impact.Table 4.17-8. Estimates Of Increased Water Use And Solvent Disposed Of In Wastewater As A Result Of Applying Carbon Adsorption In Typical Perc Solvent Dry Cleaning Plants
Annual Release Quantity (kg/yr):	Coin-op=0.2Commercial = 1.4Industrial = 13.5(see page 536 of 580)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1978)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chiriac, R.,Carre, J.,Perrodin, Y.,Vaillant, H.,Gasso, S.,Miele, P.. 2009. Study of the dispersion of VOCs emitted by a municipal solid waste landfill. Atmospheric Environment.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	460574

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Municipal landfill
Environmental Media:	air
Release or Emission Factor:	Old clothes soaked with tetrachlorethylene and trichlorethylene can be found in wastes"

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	peer-reviewed article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	France
	Metric 3:	Applicability	Unacceptable	× 2	8	Air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	source from <10 years ago
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Sonnenfeld, N.,Hertz-Picciotto, I.,Kaye, W. E.. 2001. Tetrachloroethylene in drinking water and birth outcomes at the US Marine Corps Base at Camp Lejeune, North Carolina. American Journal of Epidemiology.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	630990

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release or Emission Factor:	none.Only VOC concentrations in an on base finished water supply well.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	peer-reviewed article
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Contaminated drinking water is out of scope.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Medium	× 1	2	range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	632416

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Environmental Media:	air and water
Release or Emission Factor:	air=322.34 tonnes/yrwater=3.77 tonnes/yr"...facilities dedicated to surface treatment with organic solvents... mainly produces emissions of organic compounds in air (322.34 tonnes/yr tetrachloroethylene, 654.23 tonnes/yr trichloroethylene, and 94,782 tonnes/yr nonmethane volatile organic compounds), while low indirect emission to water (3.77 tonnes/yr) consist of benzene, toluene, ethylbenzene, and xylenes."

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the University of Santiago de Compostela.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 10 years old (2006)
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness unclear
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	632416

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970186

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Release Source:	8 machine types/configurations discussed with air, water and hazardous waste releases documented for each
Disposal /Treatment Method:	Treatment methods vary from none to carbon adsorber
Environmental Media:	air, water, hazardous waste
Annual Release Quantity (kg/yr):	Air: range of 83-501 gal/yrWater: range of 0.007 - 0.1 gal/yrHazardous waste: 127 gal/yr

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	PCE dry cleaning data, though much of it is outdated technology
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years ago (1980s and 1990s)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement, worker activity, but does not provide measurement duration or all sample locations
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kargar, M.,Nadafi, K.,Nabizadeh, R.,Nasseri, S.,Mesdaghinia, A.,Mahvi, A. H.,Alimohammadi, M.,Nazmara, S.,Rastkari, N.. 2013. Survey of Hazardous Organic Compounds in the Groundwater, Air and Wastewater Effluents Near the Tehran Automobile Industry. Bulletin of Environmental Contamination and Toxicology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	2128072

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Industrial wastewater treatment
Release Source:	Effluent of wastewater treatment from auto plant
Disposal /Treatment Method:	The collected wastewater from car industryprocess enters wastewater treatment plant in the factory. The wastewater treatment plant in factoryconsists of screening, primary sedimentation, equalizationtank, pre aeration, coagulation and flocculation (DAFsystem), activated sludge, clarifier, sand filtration andchlorination.
Environmental Media:	water
Release or Emission Factor:	Coagulation Effluent - 0.17-0.06 (mean 0.129)Biological effluent - 0.07 - 0.03 (mean 0.043)Disinfection Effluent - 0.09 - 0.03 (mean 0.061)
Release Estimation Method:	Water sampling GC-FID analysis with VARIAN CP-3800
Waste Treatment Method:	screening, primary sedimentation, equalization tank, pre aeration, coagulation and flocculation (DAF system), activated sludge, clarifier, sand filtration and chlorination

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Iranian Dept. of Enviro. Health Engineering
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Iran
	Metric 3:	Applicability	High	× 2	2	Degreasing metal parts in auto industry
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized

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Source Citation:	Kargar, M.,Nadafi, K.,Nabizadeh, R.,Nasseri, S.,Mesdaghinia, A.,Mahvi, A. H.,Alimohammadi, M.,Nazmara, S.,Rastkari, N.. 2013. Survey of Hazardous Organic Compounds in the Groundwater, Air and Wastewater Effluents Near the Tehran Automobile Industry. Bulletin of Environmental Contamination and Toxicology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	2128072

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Variability presented
Overall Quality Determination†		High		1.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hughes, M. A.,Degroot, J. L. B.. 1993. A PET RECYCLING PROCESS. Chemical Engineering Research and Design.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2908066

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Recycling
Release Source:	glue residues in distillation "bottoms"

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Institution of Chem. Eng.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK
	Metric 3:	Applicability	High	× 2	2	Use of PERC to clean glue residues of PET is in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	1993
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Schuetz, C.,Bogner, J.,Chanton, J.,Blake, D.,Morcet, M.,Kjeldsen, P.. 2003. Comparative oxidation and net emissions of methane and selected non-methane organic compounds in landfill cover soils. Environmental Science and Technology.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2528560

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	municipal landfill
Release Source:	surface emissions
Disposal /Treatment Method:	landfill
Environmental Media:	air

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Technical University of Denmark
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Denmark
	Metric 3:	Applicability	Unacceptable	× 2	8	Air releases not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2003
	Metric 5:	Sample Size	High	× 1	1	statistics fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability presented
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Bhattacharya, S. K.,Madura, R. L.,Dobbs, R. A.,Angara, R. V.,Tabak, H.. 1996. Fate of selected RCRA compounds in a pilot-scale activated sludge system. Water Environment Research.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	659813

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Publicly owned treatment works (POTW)
Environmental Media:	air
Release or Emission Factor:	An air sweep equivalent to a 4 km/h wind was maintained over the surface of the clarifier by exhausting air at 8,500 L/min...Air flow in the aeration basins averaged 4,250 L/min"Concentrations in the primary and secondary air are included in table 4 on page 5 of 10 (table 10 has air emission as a percent volatilized/ stripped).The test system was spiked continuously for 10 weeks with acetone, methyl ethyl ketone (MEK), cyclohexanone, tetrahydrofuran (THF), carbon tetrachloride (CT), 1,1,1 -trichloroethane (1,1,1-TCA), 1,1,2-trich]oroethane (1,1,2-TCA), trichloroethy] ene (TCE), tetrachloroethylene (PCE), chlorobenzene (CB), and ethy]benzene (EB). A continuous feed of spike toxic cocktail was used to produce an influent concentration of 0.25 mg/L of each individual organic compound and create an "acclimated" biomass.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The "Water Environment Research" is a quality journal; the authors are connected with Tulane University.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	The pilot treatment systems chosen as a representative POTW design consisted of primary clarification followed by conventional activated sludge treatment.
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1996)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized with a standard deviation with uncertain statistics
Domain 3: Accessibility/Clarity						

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Source Citation:	Bhattacharya, S. K.,Madura, R. L.,Dobbs, R. A.,Angara, R. V.,Tabak, H.. 1996. Fate of selected RCRA compounds in a pilot-scale activated sludge system. Water Environment Research.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	659813

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	The report addresses variability and uncertainty in the results.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Bhattacharya, S. K.,Madura, R. L.,Dobbs, R. A.,Angara, R. V.,Tabak, H.. 1996. Fate of selected RCRA compounds in a pilot-scale activated sludge system. Water Environment Research.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	659813

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Publicly owned treatment works (POTW)
Environmental Media:	waste water
Release or Emission Factor:	Concentrations in the primary and secondary effluent are included in table 4 on page 5 of 10.The test system was spiked continuously for 10 weeks with acetone, methyl ethyl ketone (MEK), cyclohexanone, tetrahydrofuran (THF), carbon tetrachloride (CT), 1,1,1 -trichloroethane (1,1,1-TCA), 1,1,2-trich]oroethane (1,1,2-TCA), trichloroethy] ene (TCE), tetrachloroethylene (PCE), chlorobenzene (CB), and ethy]benzene (EB). A continuous feed of spike toxic cocktail was used to produce an influent concentration of 0.25 mg/L of each individual organic compound and create an "acclimated" biomass.
P2 Control & percent Efficiency:	bio-degradedation on average is negative 16 percent (see table 11 on page 9 of 10).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The "Water Environment Research" is a quality journal; the authors are connected with Tulane University.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	The pilot treatment systems chosen as a representative POTW design consisted of primary clarification followed by conventional activated sludge treatment.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1996)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	Bhattacharya, S. K.,Madura, R. L.,Dobbs, R. A.,Angara, R. V.,Tabak, H.. 1996. Fate of selected RCRA compounds in a pilot-scale activated sludge system. Water Environment Research.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	659813

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	The report addresses variability and uncertainty in the results.
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Demond, A. H.. 1982. A source of tetrachloroethylene in the drinking water of New England: An evaluation of the toxicity of tetrachloroethylene and the prediction of its leaching rates from vinyl-lined asbestos-cement pipe.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	758556

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Publicly owned treatment works (POTW)
Environmental Media:	sewage sludge
Release or Emission Factor:	typical range (ug/kg): 290, 61, and <7[pg 129 of 179 - source: A.D. Little, 1980]
Waste Treatment Method:	"the chemistry of PCE does not suggest any easy or convenient method for ridding the water of its presence" Its physical nature, however does suggest simple removal mechnism. Its low azeotropic boiling point would allow for rapid removal through boiling of the contaminated water and its high volatility permits the stripping of PCE by means of an aeration column [pg 127 of 197].

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Master thesis for MIT
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (submitted in 1983)
	Metric 5:	Sample Size	Medium	× 1	2	range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.2	

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Source Citation:	Demond, A. H.. 1982. A source of tetrachloroethylene in the drinking water of New England: An evaluation of the toxicity of tetrachloroethylene and the prediction of its leaching rates from vinyl-lined asbestos-cement pipe.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	758556

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Demond, A. H.. 1982. A source of tetrachloroethylene in the drinking water of New England: An evaluation of the toxicity of tetrachloroethylene and the prediction of its leaching rates from vinyl-lined asbestos-cement pipe.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	758556

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	waste water
Release or Emission Factor:	typical range (ug/l): 5,000 - 110,000[pg 129 of 179 - source: A.D. Little, 1980]]

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Master thesis for MIT
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (submitted in 1983)
	Metric 5:	Sample Size	Medium	× 1	2	range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	2008. Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1585239

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvent-based paints and coatings, including for chemical milling
Release or Emission Factor:	The NSPS sets VOC content limits for prime coats (1.5 kg/liter coating solids applied), color coats (1.5 kg/liter coating solids applied), texture coats (2.3 kg/liter coating solids applied), and touch-up coats (2.3 kg/liter coating solids applied) in any facility in which plastic parts are coated for use in the manufacturing of business machines.
Waste Treatment Method:	1) more effective application; 2) coating reformulation; 3) capture system; 4) add on control e.g., oxidation, adsorption; and 5) work practices.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	High	× 2	2	source from <10 years ago
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

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Source Citation:	2008. Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1585239

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tobiszewski, M.,NamieÅnik, J.. 2013. Distribution of volatile organohalogen compounds in petrochemical plant water streams. Chemistry and Ecology.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3490937

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Publicly owned treatment works (POTW)
Environmental Media:	waste water
Release or Emission Factor:	The distribution patterns of halogenated volatile organic compounds in petrochemical water systems and WWTP were assessed.++++++++++'PCE was detected at trace levels at the wastewater treatment plant process wastewater, oiled rainwater and oiled drainage water inlets.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	"Chemistry and Ecology" is a quality journal; the authors are connected with Polands Gdansk University of Technology .
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (published in 2013)
	Metric 5:	Sample Size	Low	× 1	3	Single values, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vroblesky, D. onA,Petkewich, M. D.,Lowery, M. A.,Landmeyer, J. E.. 2011. Sewers as a Source and Sink of Chlorinated-Solvent Groundwater Contamination, Marine Corps Recruit Depot, Parris Island, South Carolina. Ground Water Monitoring and Remediation.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3562258

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Storage
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Release Source:	surface spill

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NGWA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Discusses spillage, not release from use or purposeful disposal
	Metric 4:	Temporal Representativeness	High	× 2	2	source from <10 years ago
	Metric 5:	Sample Size	Medium	× 1	2	range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Murphy, B. L.. 2016. Vapor degreasing with chlorinated solvents. Environmental Forensics.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3544388

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Release Source:	Waste ConveyorsWaste Open Top Unit
Disposal /Treatment Method:	608 gallons PCE/Unit with 284000 units in use in 1974410 gal/unit with 1,280,000 units in use in 1974
Environmental Media:	air, water

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Environmental Forensics Journal
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2016 article, but most data is much older covering 1920s - 1980s
	Metric 5:	Sample Size	N/A		N/A	Not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Some meta data discussion
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not discussed in detail
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Us, E. P. A.. 2017. Paper industry.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986889

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Environmental Media:	land
Release or Emission Factor:	The large-volume wastes produced by the paper industry are not often classified as hazardous under RCRA, but it's use of PERC in cleaning and degreasing, specifically solvent waste and toxic rinse water, might be hazardous.
Waste Treatment Method:	Waste minimization techniques that can help you reduce the amount of hazardous waste that you generate include: 1) Production planning and sequencing, 2) Process/equipment adjustment or modification, 3) Raw material substitution, 4) Loss prevention and housekeeping, 5) Waste segregation and separation, and 6) Recycling.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1990)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Us, E. P. A.. 2017. Paper industry.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986889

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Intermediate in basic organic chemical manufacturing
Environmental Media:	air +++++land+++++water
Release or Emission Factor:	As a volatile organic compound (VOC), emissions of perchloroethylene from industrial installations are regulated in the EU under the Industrial Emissions Directive (2010/75/EU) (formerly by the Solvent Emissions Directive (1999/13/EC)), and other directives.++++++++++++++++During the production of chlorinated solvents, integrated manufacturing methods are employed so that waste from one process is used in another process. As a result, waste from the manufacturing plant is kept to a minimum; any toxic or potentially environmentally damaging wastes are recycled and converted to useful products, and final waste is disposed of by destruction/incineration.++++++++++++Waste waters containing perchloroethylene above certain levels need to be treated by industrial or municipal sewage treatment plants, to keep emissions to natural waters below the limits set by legislation.
Waste Treatment Method:	ECSA strongly encourages the use of state-of-the-art, contained systems to avoid the release of perchloroethylene into the environment.++++++++++Direct photolysis is not expected to be an important removal process for perchloroethylene, but it undergoes reactions with hydroxyl radicals in the atmosphere, resulting in a half-life in the atmosphere of around 50 days.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope

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Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Wsp,. 2015. Re: Offsite groundwater monitoring plan: Former Kop-Flex facility, voluntary cleanup program site #31: Hanover, Maryland: Project no. E0039196/07.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982202

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Release or Emission Factor:	Kop-Flex formerly manufactured flexible couplings for the mechanical power transmission industry at the site. Historical releases of chlorinated solvents at the former Kop-Flex facility contaminated well water; groundwater monitoring plan is discussed.PCE was detected in the groundwater.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Offsite groundwater monitoring plan submitted to Maryland Department of the Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Covers conditions of use in scope, but all exposures are to the general population.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (letter dated 2015).
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

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Source Citation:	Wsp,. 2015. Re: Offsite groundwater monitoring plan: Former Kop-Flex facility, voluntary cleanup program site #31: Hanover, Maryland: Project no. E0039196/07.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982202

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: $\geq$ 1 to $<$ 1.7; Medium: $\geq$ 1.7 to $<$ 2.3; Low: $\geq$ 2.3 to $\leq$ 3.

Source Citation:	Fdoh,. 2017. Florida hazardous waste site: Health risk assessments.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982215

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Pesticide, fertilizer and other agricultural chemical manufacturing
Release or Emission Factor:	Copy of Florida Department of Health website listing a collection of hazardous waste sites. Listing shows facility name, location, the type of site, and contaminants. Twentyfive sites list PCE as a contaminant e.g., metal plating company, concrete mixing plant.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Florida Dep of Health
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Source is a website with a list of reports from Florida Dep of Health, no information relevant to assessment on website
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	data sources not fully documented
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	No Comment.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

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Source Citation:	Fdoh,. 2017. Florida hazardous waste site: Health risk assessments.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982215

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Erm,. 2017. Life cycle assessment of used oil management.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982372

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Release or Emission Factor:	As Table 4.3 shows, there are considerable variations in the volume of used oil generated, collected and the disposition over the years 2007-2011.
Annual Release Quantity (kg/yr):	Table 4.6 The amount of total used oil in kg sent to each waste management option in each scenario in Phase II
Waste Treatment Method:	Pollution control during combustion (see Section 5.1.11).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	LCA authored by "Environmental Resources Management" to satisfy CA Senate Bill 546 (Lowenthal).
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	California specific.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2016).
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Co, D. O. H.. 1992. Lessons learned in pollution prevention: Case studies of three print shops.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982089

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Solvent-based paints and coatings
Environmental Media:	land /water++++++air
Release or Emission Factor:	Equipment cleaning wastes and toxic air emissions from cleaning solvents are currently the main hazards in the print shops that were studied include...Spent Press Blanket and Roller Wash and Deglazer. Examples are flammable or combustible wash solvents that contain naphtha or Stoddard solvents and tetrachloroethylene (perchloroethylene); roller glaze removers that contain acetone, toluene and 1 , 1,l trichloroethane.++++++++++++Toxic Air Emissions that occur during cleaning operations. The substances that are of most concern are toluene, 1,1,1 trichloroethane and tetrachloroethylene (perchloroethylene).
P2 Control & percent Efficiency:	Use of "cleaner" or less hazardous material substitutes. New products that were tried out to replace the press blanke/roller wash and deglazers, included Golden Technology"s BIO T"

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Colorado Department of Health
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	US with site visits to 3 Colorado print shops
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1992)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						

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Source Citation:	Co, D. O. H.. 1992. Lessons learned in pollution prevention: Case studies of three print shops.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982089

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air++++++water+++++land
Release or Emission Factor:	An emission standard for the use of perchloroethylene in drycleaning, published in September 1993, was the first standard adopted under the revised Section 112. " In many states, permitting for small degreasing sources has been deferred.+++++++++++++++In 1991, EPA established national primary drinking water regulations setting a maximum contaminant level, or MCL, of 5 micrograms per liter for perchloroethylene (equal to 5 parts per billion, or ppb), and a maximum contaminant level goal (MCLG) of zero.+++++++++++++++Perchloroethylene waste is considered hazardous under the RCRA and many state laws. Such waste must be stored, transported, and disposed of in accordance with applicable RCRA and state requirements. The reportable quantity for releases of perchloroethylene under the CERCLA is 100 pounds.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						

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Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Mehta S, Besore T.. 1989. Alternatives to organic solvents in metal-cleaning operations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982094

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Environmental Media:	land
Release or Emission Factor:	Regulations governing organic solvents fall into three categories: waste management under the Resource Conservation and Recovery Act (RCRA), transportation under the Hazardous Materials Transportation Act, and employee training under the Occupational Safety and Health Act (OSHA)... In general, the regulations state that if a business produces more than 220 pounds per month, it is responsible for cradle-to-grave documentation of the hazardous wastes it generates. Perchloroethylene (U210) is regulated under RCRA.
P2 Control & percent Efficiency:	Biodegradable cleaners that can replace many chlorinated solvents are available and have overall usage costs comparable to those of chlorinated solvents. E.g., AT&T has successfully used biodegradable solvent Bioact EC7, produced by Petroferm Inc. of Fernandina Beach, Florida for cleaning operations....

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Illinois Hazardous Waste Research & Information Center
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1989)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	Mehta S, Besore T.. 1989. Alternatives to organic solvents in metal-cleaning operations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982094

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cameo, Chemicals. 2016. Chemical datasheet: perchloroethylene.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981011

EXTRACTION

Parameter	Data
Life Cycle Stage:	unkown
Life Cycle Description (Subcategory of Use):	unkown
Environmental Media:	land
Release or Emission Factor:	CERCLA reportable quanity=100 pounds (Code: U210).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Department of Commerce - NOAA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	File has regulatory information and data on physical properties that apply to multiple conditions of use
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2016).
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	The Finnish Environment, Institute. 2017. Data bank of environmental properties of chemicals tetrachloroethylene.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981150

EXTRACTION

Parameter	Data
Life Cycle Stage:	unkown
Life Cycle Description (Subcategory of Use):	unkown
Environmental Media:	air+++water+++waste water
Release or Emission Factor:	Mobility" equilibrium distribution = 99.45 percent in air++++++++++++++Insoluble in water...lab experiments show PCE will evaporate rapidly from water.++++++++++Inhibition in active sludge 10 mg/l

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Finlands environmental administration
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Northern Europe
	Metric 3:	Applicability	High	× 2	2	various general data that may apply to multiple COUs
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2017).
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McComas, C.. 1996. Dry cleaning equipment upgrades cut costs and reduce perc.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982078

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	Three options exist for perc dry cleaning equipment upgrades:1. Switch to Dry-to-Dry Machines...Perc Use Reduction: Up to 90 percent annually2. Add Refrigerated Condensers...Perc Use Reduction: Up to 40-50 percent annually.3. Add Carbon Adsorption Units...dependsBy September 22, 1996, depending on your annual perc consumption (greater than 140 gallons per year for dry-to-dry systems and greater than 200 gallons per year for transfer systems) you may need to add a refrigerated condenser to nonrefrigerated systems to comply with the NESHAP.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Small Businesses Assistance Program (SBAP) at the Minnesota Pollution Control Agency
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air emissions are out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1996)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	McComas, C.. 1996. Dry cleaning equipment upgrades cut costs and reduce perc.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982078

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.5.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Busler, C.. 1984. Research briefs: Still residue and cooker muck update.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982080

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	land
Release or Emission Factor:	Several states have already enacted stringent laws regulating hazardous wastes, and we can expect this trend to continue on both federal and state levels...Since International Fabricare Institute (IFI) introduced the water addition method of reducing perc content in residues (Technical bulletin 560), many member drycleaners have used this method in their plants...Application of a steam sweep also helps reduce the perc content of still residues.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	International Fabricare Institute (now called the Drycleaning & Laundry Institute)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1984)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

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Source Citation:	Busler, C.. 1984. Research briefs: Still residue and cooker muck update.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982080

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lighthouse Communications, Group. 2017. Dry cleaners: Switch to wet cleaning process.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982081

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	land
Release or Emission Factor:	Denver dry cleaner switches to a wet cleaning process. The new system uses 80 percent less perc and hazardous waste disposal has decreased 80 percent .Reduced potential for spills and leaks of perc and the associated liability.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Colorado Department of Public Health and Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1995)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	University of, Minnesota. 2017. Dry cleaners; Waste and emission reduction alternatives.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982082

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	air
Release or Emission Factor:	Many opportunities exist to reduce perc use, including:1. improved operating and maintenance procedures (e.g., employee training, consult operating manuals, general housekeeping), 2. more efficient equipment, and3. incorporation of substitute cleaning products and methods.
Waste Treatment Method:	Control devices may include external refrigerated condensers and carbon adsorbers.Switching from the more traditional transfer machines to a more efficient refrigerated dry-to-dry machine eliminates garment transfer, and can reduce perc use and purchase in a given year by as much as 90 percent...Emission-free still sludge is another feature of new machines that dramatically reduces perc in sludge and lowers operator exposure to perc fumes.
P2 Control & percent Efficiency:	Even more revolutionary cleaning systems are on the horizon, such as "dry wash," a carbon dioxide technology.Dry cleaners who wish to become a Certified Environmental Dry Cleaner must pay a fee and pass an examination.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Minnesota Technical Assistance Program, University of Minnesota
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Air emissions are out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1997)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	University of, Minnesota. 2017. Dry cleaners; Waste and emission reduction alternatives.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982082

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.5.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Wa, D. E.. 1997. Fact sheet: Drycleaning and waste reduction.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982084

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	land
Release or Emission Factor:	Typical wastes generated by drycleaners include spent perchloroethylene ("perc"), still bottoms from distillation of solvents, spent filter cartridges, cooked powder residue and water contaminated with "perc." These wastes are categorized as dangerous wastes by Washington State's Dangerous Waste Regulations (Chapter 173-303 WAC).
Waste Treatment Method:	1. Good housekeeping measures can greatly decrease the amount of wastes that are generated. To reduce excess waste production: e.g., Keep tight fitting lids and bungs on containers to prevent loss of chemicals through evaporation or spillage.2. Substitute Raw Materials...use a solvent which is not considered ignitable.3. Modify Your Process...If you are currently using a wet-to-dry cleaning unit, consider replacing it with a dry-to-dry unit.4. Recycle Solvent...Distill your spent "perc" in a distillation unit.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Washington State Department of Ecology - Office of Waste Reduction and Recycling
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1997)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	Wa, D. E.. 1997. Fact sheet: Drycleaning and waste reduction.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982084

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Irta,. 2000. Brake cleaning with water-based cleaning systems.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982085

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Aerosol spray degreaser/cleaner
Environmental Media:	wastewater
Release or Emission Factor:	...The wastewater discharge agencies participating in the project expressed concern about the possibility of brake cleaner components, particularly PERC, entering the sewer...the oil and grease limit in the Orange County Sanitation District is 100 mg/l... the City of Los Angeles limit is 600 mg/l.
P2 Control & percent Efficiency:	Other solvent-based aerosol brake cleaners are available, and some shops may convert to these cleaners. Water-based brake cleaners are also effective, and can be adopted by virtually all shops.The demonstration project involved testing seven water-based brake cleaning formulations in five different types of equipment in 10 auto repair facilities to determine their feasibility and to optimize their conditions of use.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Institute for Research and Technical Assistance (IRTA)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Irta,. 2000. Brake cleaning with water-based cleaning systems.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982085

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cohen, L.. 1992. Special report: Dry cleaning fumes cause health worries, push search for alternatives.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982086

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Environmental Media:	solid waste
Release or Emission Factor:	The residue from the solvent distillation, once routinely landfilled, is now primarily recycled; it is removed daily and sent out to industrial recyclers who reclaim as much solvent as possible, then landfill or incinerate what's left.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Article is publised in a journal (i.e., The Neighborhood Works) that is not peer reviewed; the techniques used in the report are not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1992)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Low		2.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	His,. 2016. The economic benefits of chlorine chemistry in fluorocarbons in the United States and Canada.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978162

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
P2 Control & percent Efficiency:	Alternatives to the use of fluorocarbons in solvent cleaning and degreasing applications.Processes:* Plasma arc or UV/ozone cleaning* Supercritical CO2 or CO2 snow cleaningAlternative solvents:* Isopropyl alcohol* Propylene glycol ethers* etc.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The American Chemistry Council
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2016)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	2007. Control techniques guidelines for metal furniture coatings.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860358

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvent-based paints and coatings, including for chemical milling
Environmental Media:	air
Release or Emission Factor:	Three CARB air districts (i.e., Imperial Couny, Shasta County, Tehema County) restricts VOC for metal furniture coating, but exempt PCE and other "drying halogenated hydrocarbons".

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2007)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2006. Health consultation: Historical outdoor air emissions in the Endicott area: International Business Machines Corporation (IBM): Village of Endicott, Broome County, New York EPA facility ID: NYD002233039, Part 2.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Environmental Media:	air
Release or Emission Factor:	Table 5 summarizes estimated ambient air PCE concentrations attributed to IBM"s past emissions... the highest estimated 24-hour and 1-hour average concentrations (95 ?g/m3 and 370 ?g/m3, respectively) were both lower than ATSDR"s comparison value for non-cancer effects resulting from acute exposures...Note: ATSDR used a computer model to estimate how air emissions from the former IBM facility affected local air quality" Occupational exposures are not addressed in this document because ATSDR"s mandate does not include evaluating most occupational exposure scenarios.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US ATSDR
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2006)
	Metric 5:	Sample Size	Low	× 1	3	Single value, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Overall release for all uses of PCE, cannot be attributed to a single scenario
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Atsdr,. 2006. Health consultation: Historical outdoor air emissions in the Endicott area: International Business Machines Corporation (IBM): Village of Endicott, Broome County, New York EPA facility ID: NYD002233039, Part 2.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978093

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.7.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Pnl,. 2015. Performance assessment for pump-and-treat closure or transition.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3975008

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial useProcessing
Life Cycle Description (Subcategory of Use):	Dry cleaning solventRecycling
Environmental Media:	soil
Release or Emission Factor:	Three groundwater "pump-and-treat" remediation case studies involved PCE (i.e., a national lab, a former dry cleaner, an oil recycling operation). Some details were provided (e.g., PCE groundwater concentrations, pump-and-treat rates, geology), but root-cause spills or waste-water releases were not discussed.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US DOE
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	groundwater treatment - not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2015)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.0.

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Source Citation:	Pnl,. 2015. Performance assessment for pump-and-treat closure or transition.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3975008

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments

⋆⋆ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2001. Guide to industrial assessments for pollution prevention and energy efficiency.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827322

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Release or Emission Factor:	On-site recycling is defined as the process of reclaiming a spent cleaning solution in or near the original process line for reuse. The decision to recycle wastes on-site is typically based on the economics of cleaner reuse and quality control"Distillation is the process of separating two miscible liquids based on the difference in their vapor pressures... If the boiling point of the solvent is high (greater than 200 OF as with perchloroethylene), distillation can be performed under vacuum to minimize thermal decomposition of the solvent or impurities.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	pollution prevention information for multiple in-scope conditions of use
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2001)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1993. Guideline series: Control of volatile organic compound emissions from reactor processes and distillation operations processes in the synthetic organic chemical manufacturing industry.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Environmental Media:	air
Release or Emission Factor:	Table 7 (page 143 of 277) shows that PERC emissions are affected by two NSPS regulations for reactors and distillation.
Waste Treatment Method:	Control Techniques Guideline (CTG) includes discussions on a varierty of emission control techniques including: 1) combustion control devices (flares, catalytic oxidizers), 2) recovery devices (adsorption, absorption, condensation).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1993)
	Metric 5:	Sample Size	Low	× 1	3	Single value, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Discussed VOC emission variability with various chemical reactions.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	1993. Guideline series: Control of volatile organic compound emissions from reactor processes and distillation operations processes in the synthetic organic chemical manufacturing industry.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860355

EVALUATION

Domain	Metric	Rating	MWF[★]	Score	Comments

[★★] Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

[★] MWF = Metric Weighting Factor

[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1989. Alternative control technology document – Halogenated solvent cleaners.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860356

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Release or Emission Factor:	PERC is one of five commonly used halogenated solvents. It possess the physical characteristics necessary to handle a variety of industrial cleaning situations. It can dissolve many common residues from manufacturing processes, have little or no flammability, and can achieve a high degree of cleanliness, even on very small or intricate parts.Table 5-5 (on page 162 of 239) lists retrofit control options (e.g., automated parts handling) for open top vapor cleaners (OTVC) and annual air emission reductions for each. Table 5-11 (page 173 of 239) list retrofit controls for in-line cleaners.EPA intends to list PERC as a HAP.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	US EPA
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4: Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1989)
	Metric 5: Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussed VOC emission reduction as a range.

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Source Citation:	1989. Alternative control technology document – Halogenated solvent cleaners.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860356

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

⋆⋆ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1977. Control of volatile organic emissions from existing stationary sources – Volume II: Surface coating of cans, coils, paper, fabrics, automobiles, and light-duty trucks.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Release or Emission Factor:	Perchloroethylene, the principal solvent employed in the dry cleaning industry, has low reactivity. Studies show it may not form oxidant until they have been transported substantial distances and become greatly diluted.
Waste Treatment Method:	Available control technology is highly cost effective for large perchloroethylene dry cleaning operations. However, for coin-operated and small dry cleaners, the same equipment would represent a heavy economic burden.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1977)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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Source Citation:	1977. Control of volatile organic emissions from existing stationary sources – Volume II: Surface coating of cans, coils, paper, fabrics, automobiles, and light-duty trucks.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860359

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1976. Control of volatile organic emissions from existing stationary sources – Volume I: Control methods for surface-coating operations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860354

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solventSolvent-based paints and coatings, including for chemical milling
Environmental Media:	air
Waste Treatment Method:	Condensation is widley used in the dry cleaning industry for PERC recovery, because the relatively high cost of chlorinated solvents makes recovery attractive (pg 65 of 174).Also includes discussions on VOC control technologies e.g., carbon adsorption, incineration, scrubbing, material changes (powder coatings).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	air out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1976)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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Source Citation:	1976. Control of volatile organic emissions from existing stationary sources – Volume I: Control methods for surface-coating operations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860354

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2009. Water treatment technology feasibility support document for chemical contaminants for the second six-year review of national primary drinking water regulations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970166

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Environmental Media:	water
Release or Emission Factor:	The current maximum contaminant level (MCL) is 0.005 mg/L and the current best available technologies (BATs) are granular activated carbon (GAC) and packed tower aeration (PTA).
P2 Control & percent Efficiency:	EPA concluded that PTA systems designed using reasonable engineering practices could achieve 99 percent removal of nine VOCs...EPA has concluded that GAC can achieve a high level of removal (up to 99.9 percent) of VOCs (50 FR 46902). Carbon usage rates (0.1144 lbs/1,000 gal) are low compared with other organic contaminants (56 FR 3526).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA, Office of Water
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Medium	× 2	4	Contains information on water pollution control (does not discuss the source of emissions).
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2009)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						

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Source Citation:	U.S, E. P. A.. 2009. Water treatment technology feasibility support document for chemical contaminants for the second six-year review of national primary drinking water regulations.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970166

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	US EPA. 2020. 2017 National Emissions Inventory (NEI) data (April 2020 version).
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6983116

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Release Source:	Provides unit/process of release.
Environmental Media:	Provides media of release
Release or Emission Factor:	Provides release data
Release Days per Year:	Provides annual operating time.
P2 Control & percent Efficiency:	Provides controls information.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Submitters provide general method used to calculate emissions, but details not provided.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	NEI is U.S. based data
	Metric 3:	Applicability	High	× 2	2	NEI includes industries included in the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	NEI data are from 2017
	Metric 5:	Sample Size	Medium	× 1	2	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	× 1	1	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	× 1	3	NEI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination†			High		1.4	

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Source Citation:	US EPA. 2020. 2017 National Emissions Inventory (NEI) data (April 2020 version).
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6983116

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	US EPA. 2020. 2017 Toxics Release Inventory (TRI) data.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6983117

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Environmental Media:	Provides media of release
Release or Emission Factor:	Provides release data

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Methodology used by submitters to estimate release data is not known.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	TRI is U.S. based data
	Metric 3:	Applicability	High	× 2	2	TRI includes industries included in the scopes of multiple chemicals
	Metric 4:	Temporal Representativeness	High	× 2	2	TRI data are from 2017
	Metric 5:	Sample Size	Medium	× 1	2	Due to reporting requirements, statistical representativeness is unclear.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	TRI only includes release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	TRI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	US EPA. 2020. Toxics Release Inventory (TRI), reporting years 2012-2018.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6983118

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Environmental Media:	Provides media of release
Release or Emission Factor:	Provides release data

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Methodology used by submitters to estimate release data is not known.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	TRI is U.S. based data
	Metric 3:	Applicability	High	× 2	2	TRI includes industries included in the scopes of multiple chemicals
	Metric 4:	Temporal Representativeness	High	× 2	2	TRI data are from less than 10 years ago (2012-2018)
	Metric 5:	Sample Size	Medium	× 1	2	Due to reporting requirements, statistical representativeness is unclear.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	TRI only includes release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	TRI does not address variability or uncertainty in submitter provided data.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	US EPA. 2020. EPA Discharge Monitoring Report Data, reporting years 2012-2018.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6983119

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Environmental Media:	Provides media of release
Release or Emission Factor:	Provides release data

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Methodology used by submitters to estimate release data is not known.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	DMR is U.S. based data
	Metric 3:	Applicability	High	× 2	2	DMR includes industries included in the scopes of multiple chemicals
	Metric 4:	Temporal Representativeness	High	× 2	2	DMR data are from less than 10 years ago (2012-2018)
	Metric 5:	Sample Size	Medium	× 1	2	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	DMR only includes release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	DMR does not address variability or uncertainty in submitter provided data.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Occupational Exposure

Source Citation:	Seiji, K.,Inoue, O.,Jin, C.,Liu, Y. T.,Cai, S. X.,Ohashi, M.,Watanabe, T.,Nakatsuka, H.,Kawai, T.,Ikeda, M.. 1989. Dose-excretion relationship in tetrachloroethylene-exposed workers and the effect of tetrachloroethylene co-exposure on trichloroethylene metabolism. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1300

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture and Use
Life Cycle Description (Subcategory of Use):	Manufacturing and Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	GM: 10.8 (ppm)Max: 112.4 (ppm)
Number of Samples:	Not clear, equal to number of workers?
Type of Measurement or Method:	8-hr TWA
Worker Activity:	No manufacturing descriptionDry Cleaning: In fully automated amchines, clothes dry prior to removal
Number of Workers:	Manufacturing: 38Dry Cleaning: 121
Type of Sampling:	PBZ
Exposure Duration:	8 hr
Analytic Method:	CS2 extraction and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Study conducted in China
	Metric 3:	Applicability	High	× 2	2	Data from manufacturing and dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1989).
	Metric 5:	Sample Size	Medium	× 1	2	Sample size not clearly stated, but geometric mean, standard deviation and max given.
Domain 3: Accessibility/Clarity						

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Source Citation:	Seiji, K.,Inoue, O.,Jin, C.,Liu, Y. T.,Cai, S. X.,Ohashi, M.,Watanabe, T.,Nakatsuka, H.,Kawai, T.,Ikeda, M.. 1989. Dose-excretion relationship in tetrachloroethylene-exposed workers and the effect of tetrachloroethylene co-exposure on trichloroethylene metabolism. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1300

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Medium	× 1	2	Sample type and exposure type given, no exposure frequency or detailed worker activities
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Limited discussion on variablity/uncertainty
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Mutti, A.,Smargiassi, A.. 1998. Selective vulnerability of dopaminergic systems to industrial chemicals: risk assessment of related neuroendocrine changes. Toxicology and Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	11002

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	15 (ppm)
Number of Samples:	1
Type of Measurement or Method:	8-hr TWA

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Study from Italy (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1998).
	Metric 5:	Sample Size	Low	× 1	3	Only 1 data point given, no indication if it is average, mean, etc.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Single data point given, sample type, exposure duration, exposure frequency, worker activities not specified
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.3.

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Source Citation:	Mutti, A.,Smargiassi, A.. 1998. Selective vulnerability of dopaminergic systems to industrial chemicals: risk assessment of related neuroendocrine changes. Toxicology and Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	11002

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ipcs,. 1984. Tetrachloroethylene. Environmental Health Criteria.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	22606

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing and Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Dry Cleaning: Overall Max of 4000 mg/m3UK: 90 percent of samples below 680 mg/m3 and 50 percent below 200 mg/m3US: 27 - 1010 mg/m3 for machine operators; max of 251 mg/m3 for other workersDegreasing: 6 percent below 680 m/m3, peak of 1290 mg/m3
Number of Samples:	UK: 493US: 144
Number of Sites:	UK: 131 (dry cleaning)US: 44 (dry cleaning)
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Dry cleaning: machine operators

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US and OECD countries
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning and degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1984).
	Metric 5:	Sample Size	Medium	× 1	2	Some statistics given; howver not all data is completey characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data indicates type of measurement but not whether PBZ or Area; other information such as sample durations, exposure durations, not specified
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Ipcs,. 1984. Tetrachloroethylene. Environmental Health Criteria.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	22606

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2001. Sources, emission and exposure for trichloroethylene (TCE) and related chemicals.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	35002

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning and other uses (not specified)
Physical Form:	Liquid/vapor
Route of Exposure:	Inhalation, ingestion, dermal
Exposure Concentration (Unit):	5,897 - 219,685 ug/dayReference to 1 study indicating 3 to 149 ppm for dry cleaning
Number of Sites:	49025 (all conditions of use)Reference 1 study for dry cleaning with 44 sites.
Type of Measurement or Method:	TWA for study at dry cleaners (others not specified)
Worker Activity:	Machine operators, pressers, seamstresses, and front counter workers
Number of Workers:	450,000 Dry cleaning workers; 688,110 other workers

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1989).
	Metric 5:	Sample Size	Medium	× 1	2	Statistics provided, sample size not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type and exposure type given, no exposure frequency or duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		1.9	

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Source Citation:	U.S, E. P. A.. 2001. Sources, emission and exposure for trichloroethylene (TCE) and related chemicals.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	35002

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	van Wijngaarden, E.,Hertz-Picciotto, I.. 2004. A simple approach to performing quantitative cancer risk assessment using published results from occupational epidemiology studies. Science of the Total Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	56511

EXTRACTION

Parameter	Data
Life Cycle Stage:	Not specified
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	45 ppm-years (midpoint)
Number of Samples:	1130
Type of Measurement or Method:	8-hr TWA

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Does not specify occupational scenarios
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1989).
	Metric 5:	Sample Size	Medium	× 1	2	Statistics provided, sample size not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	type of industry, worker activities, not specified
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion on variablity/uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.7.

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Source Citation:	van Wijngaarden, E.,Hertz-Picciotto, I.. 2004. A simple approach to performing quantitative cancer risk assessment using published results from occupational epidemiology studies. Science of the Total Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	56511

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: $\geq$ 1 to $<$ 1.7; Medium: $\geq$ 1.7 to $<$ 2.3; Low: $\geq$ 2.3 to $\leq$ 3.

Source Citation:	Ohtsuki, T.,Sato, K.,Koizumi, A.,Kumai, M.,Ikeda, M.. 1983. Limited capacity of humans to metabolize tetrachloroethylene. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58163

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cold cleaning, spot cleaning, other cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	48-629 ppm
Number of Samples:	7
Type of Measurement or Method:	8-hr TWA
Worker Activity:	semi-automated dip-washing machines or hand washing of silk
Number of Workers:	61
Type of Sampling:	PBZ
Analytic Method:	CS2 extraction and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Japan (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1989).
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type, exposure type, and worker activities given, but exposure duration and frequency not provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Ohtsuki, T.,Sato, K.,Koizumi, A.,Kumai, M.,Ikeda, M.. 1983. Limited capacity of humans to metabolize tetrachloroethylene. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58163

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1976. Criteria for a recommended standard occupational exposure to tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	58207

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning, Degreasing, and other cleaning activities, other non-specified uses
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1.32-300 ppm (dry cleaning)25-1470 (other cleaning activities)80-280 ppm (other)10-900 ppm (degreasing)
Number of Sites:	given for most studies referenced; however, not all
Type of Measurement or Method:	8-hr TWA (dry-cleaning)
Worker Activity:	Recommended work practics for unloading trucks and rail cars.Cleaning steps and mixing cement (other cleaning)Other general work practice guidanceMachine operator, presser, counter, miscellaneous (dry cleaning)
Number of Workers:	275000 (total US workers)
Type of Sampling:	PBZ and area
Exposure Duration:	8 hr/day (degreasing)
Exposure Frequency:	6 day/wk (degreasing)
Engineering Control & percent Exposure Reduction:	Ventilation (dry cleaning)
PPE:	Description of respirators required at different exposure levels; recommended protective clothing and eyewear

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH report
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US study
	Metric 3:	Applicability	High	× 2	2	Data for various uses within scope
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data from studies prior to PEL and over 20 years ago, not expected to represent current conditions. Dry cleaning data expected for transfer machines which have been phased out of use by the Dry Cleaning NESHAP.

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Source Citation:	Niosh,. 1976. Criteria for a recommended standard occupational exposure to tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	58207

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	Medium	× 1	2	Statistics give for some sampling data, not for others
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Various between studies but typically not completely characterized
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ludwig, H. R.,Meister, M. V.,Roberts, D. R.,Cox, C.. 1983. Worker exposure to perchloroethylene in the commercial dry cleaning industry. American Industrial Hygiene Association Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58263

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.1-366 ppm
Number of Samples:	12-134 (depending on type of measurement and job)
Number of Sites:	44
Type of Measurement or Method:	TWA, 5 and 15 min-peak
Worker Activity:	Description for transfer and dry-to-dry machines, machine operators, pressers, and seamstresses, cleaning button/lint traps, draining still, replacing filter media.
Number of Workers:	2 to 30
Type of Sampling:	PBZ and area
Sampling Location:	Counter area
Exposure Duration:	3-8 hr
Engineering Control & percent Exposure Reduction:	Recommended ventilation
PPE:	Respirator and gloves recommended
Analytic Method:	NIOSH Method P&CAM 127 or S335

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1983).
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized

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Source Citation:	Ludwig, H. R.,Meister, M. V.,Roberts, D. R.,Cox, C.. 1983. Worker exposure to perchloroethylene in the commercial dry cleaning industry. American Industrial Hygiene Association Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58263

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Most metadata described, no information on exposure frequency
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Some discussion on variability
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kyyronen, P.,Taskinen, H.,Lindbohm, M. L.,Hemminki, K.,Heinonen, O. P.. 1989. Spontaneous abortions and congenital malformations among women exposed to tetrachloroethylene in dry cleaning. Journal of Epidemiology and Community Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58291

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Machine operator: 2-29 cm3/m3General area air: 3 to 19 cm3/m3Button strainer cleaning: 100 cm3/m3Emptying/filling machine: 4-34 cm3/m3
Worker Activity:	machine operating, cleaning button strainer, emptying/filling machine
Type of Sampling:	PBZ and area

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Finland (OECD country)
	Metric 3:	Applicability	Medium	× 2	4	Data for dry cleaning; however, the type of dry cleaning machine used is not specified
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data collected prior to PEL (1973-1983); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	Data range provided no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type provided, no information on exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Kyyronen, P.,Taskinen, H.,Lindbohm, M. L.,Hemminki, K.,Heinonen, O. P.. 1989. Spontaneous abortions and congenital malformations among women exposed to tetrachloroethylene in dry cleaning. Journal of Epidemiology and Community Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58291

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.8.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ahlborg, G., Jr.. 1990. Pregnancy outcome among women working in laundries and dry-cleaning shops using tetrachloroethylene. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58300

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	55ppm near machines25ppm in rest of shop
Worker Activity:	operating machines, spot removing, iron/pressing, cleaning and filling machines.
Type of Sampling:	area

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Sweden (OECD country)
	Metric 3:	Applicability	Medium	× 2	4	Data for dry cleaning; however, the type of dry cleaning machine used is not specified
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data collected prior to PEL; dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	Average provided, no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type provided, no information on exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.8.

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Source Citation:	Ahlborg, G., Jr.. 1990. Pregnancy outcome among women working in laundries and dry-cleaning shops using tetrachloroethylene. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58300

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Imbriani, M.,Ghittori, S.,Pezzagno, G.,Capodaglio, E.. 1988. Urinary excretion of tetrachloroethylene (perchloroethylene) in experimental and occupational exposure. Archives of Environmental and Occupational Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58324

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	65.7 mg/m3
Number of Samples:	55
Number of Workers:	55
Type of Sampling:	PBZ
Exposure Duration:	4 hr
Analytic Method:	personal passive samplers and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Italy (OECD country)
	Metric 3:	Applicability	Medium	× 2	4	Data for dry cleaning; however, the type of dry cleaning machine used is not specified
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data collected after PEL, but more than 10 years ago (1988); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	Average provided, no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type and exposure duration provided, no information on work activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Imbriani, M.,Ghittori, S.,Pezzagno, G.,Capodaglio, E.. 1988. Urinary excretion of tetrachloroethylene (perchloroethylene) in experimental and occupational exposure. Archives of Environmental and Occupational Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58324

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Materna, B. L.. 1985. Occupational exposure to perchloroethylene in the dry cleaning industry. AIHA Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58325

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	3-75.9 ppm, mean of 28.2 ppm (dry-to-dry only, source also contains data for transfer mahcines)
Number of Sites:	3
Type of Measurement or Method:	TWA (averaged over cleaning time/sample duration)
Worker Activity:	Primary task is to load and unload clothes. Periodically, workers may replace filters, transfer solvent to machine, perform maintenance on equipment, and cleaning lint/button traps
Number of Workers:	78 percent of all commercial dry cleaners have fewer than 10 employees; 20 operators sampled for exposure data
Type of Sampling:	PBZ
Exposure Duration:	55 to 433 minutes
Engineering Control & percent Exposure Reduction:	Local exhaust ventilation
PPE:	Majority of firms used none
Analytic Method:	NIOSH Method S335

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning using dry-to-dry machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1985).
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given

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Source Citation:	Materna, B. L.. 1985. Occupational exposure to perchloroethylene in the dry cleaning industry. AIHA Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58325

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Sample data fully characterized
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		High		1.6	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nakatsuka, H.,Watanabe, T.,Takeuchi, Y.,Hisanaga, N.,Shibata, E.,Suzuki, H.,Huang, M. Y.,Chen, Z.,Qu, Q. S.,Ikeda, M.. 1992. Absence of blue-yellow color vision loss among workers exposed to toluene or tetrachloroethylene, mostly at levels below occupational exposure limits. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58349

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture and Use
Life Cycle Description (Subcategory of Use):	Manufacturing and Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Manufacture: 7.2 ppm (avg for men); 27.0 ppm (avg for women)Dry Cleaning: 15.3 ppm (avg for men); 10.7 ppm (avg for women)
Number of Workers:	Manufacture: 14 men, 9 womenDry Cleaning: 20 men, 34 women

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from China (non-OECD country) and Japan (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data is for manufacture and dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data after PEL but over 10 years old (1992); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use; however, manufacturing data within acceptable timeframe
	Metric 5:	Sample Size	Low	× 1	3	Averages provided but separated for men and women workers; discrete sample results not provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Data does not specific sample type, measurement type, sample duration, exposure duration or other data needed to make data usable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Nakatsuka, H.,Watanabe, T.,Takeuchi, Y.,Hisanaga, N.,Shibata, E.,Suzuki, H.,Huang, M. Y.,Chen, Z.,Qu, Q. S.,Ikeda, M.. 1992. Absence of blue-yellow color vision loss among workers exposed to toluene or tetrachloroethylene, mostly at levels below occupational exposure limits. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58349

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.7.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Checkoway, H.,Echeverria, D.,Moon, J. D.,Heyer, N.,Costa, L. G.. 1994. Platelet monoamine oxidase B activity in workers exposed to styrene. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	63609

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	<2 - 37 ppm, mean = 13.2 ppm
Type of Measurement or Method:	8-hr TWA
Number of Workers:	6
Type of Sampling:	PBZ
Exposure Duration:	8 hr
Analytic Method:	NIOSH Method

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1994); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample data fully characterized except worker activities not described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Checkoway, H.,Echeverria, D.,Moon, J. D.,Heyer, N.,Costa, L. G.. 1994. Platelet monoamine oxidase B activity in workers exposed to styrene. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	63609

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Jang, J. Y.,Kang, S. K.,Chung, H. K.. 1993. Biological exposure indices of organic solvents for Korean workers. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	68489

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-61 ppm, mean = 22.4 ppm
Number of Samples:	13
Type of Sampling:	PBZ
Exposure Duration:	8 hr
Analytic Method:	NIOSH Method

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Korea (OECD country)
	Metric 3:	Applicability	High	× 2	2	Degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1993)
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample data fully characterized except worker activities not described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		1.8	

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Source Citation:	Jang, J. Y.,Kang, S. K.,Chung, H. K.. 1993. Biological exposure indices of organic solvents for Korean workers. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	68489

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Skender, L. J.,Karacic, V.,Prpic-Majic, D.. 1991. A comparative study of human levels of trichloroethylene and tetrachloroethylene after occupational exposure. Archives of Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	69136

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	33 -55 ppm
Number of Samples:	18
Number of Sites:	1
Type of Measurement or Method:	8-hr TWA
Type of Sampling:	PBZ
Engineering Control & percent Exposure Reduction:	>99.5 percent
Analytic Method:	Charcoal tube collection and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from Yugoslavia (non-OECD country)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1991); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Measurement type, exposure duration, exposure frequency and worker activities not described
Domain 4: Variability and Uncertainty						

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Source Citation:	Skender, L. J.,Karacic, V.,Prpic-Majic, D.. 1991. A comparative study of human levels of trichloroethylene and tetrachloroethylene after occupational exposure. Archives of Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	69136

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Aggazzotti, G.,Fantuzzi, G.,Righi, E.,Predieri, G.,Gobba, F. M.,Paltrinieri, M.,Cavalleri, A.. 1994. Occupational and environmental exposure to perchloroethylene (PCE) in dry cleaners and their family members. Archives of Environmental and Occupational Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	74875

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Median concentrations and ranges give for each facility, medians ranged from 0.6 to 75 mg/m3.
Number of Samples:	6-8 per facility
Number of Sites:	28
Type of Measurement or Method:	8-hr TWA
Number of Workers:	60
Type of Sampling:	PBZ
Exposure Duration:	8 hr
Analytic Method:	Charcoal tube collection and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Italy (OECD country
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1994); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Most metadata described, no information on exposure frequency or worker activities

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Source Citation:	Aggazzotti, G.,Fantuzzi, G.,Righi, E.,Predieri, G.,Gobba, F. M.,Paltrinieri, M.,Cavalleri, A.. 1994. Occupational and environmental exposure to perchloroethylene (PCE) in dry cleaners and their family members. Archives of Environmental and Occupational Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	74875

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Seiji, K.,Jin, C.,Watanabe, T.,Nakatsuka, H.,Ikeda, M.. 1990. Sister chromatid exchanges in peripheral lymphocytes of workers exposed to benzene, trichloroethylene, or tetrachloroethylene, with reference to smoking habits. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	75419

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture and Use
Life Cycle Description (Subcategory of Use):	Manufacturing and Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Manufacture: 17 ppm (GM), 28 ppm (75th percentile), 567 ppm (max)Dry Cleaning: 10 ppm (GM), 27 ppm (75th percentile), 179 ppm (max)
Number of Samples:	Manufacture: 19Dry Cleaning: 27
Type of Measurement or Method:	8-hr TWA
Number of Workers:	Manufacture: 19Dry Cleaning: 27
Type of Sampling:	PBZ
Exposure Duration:	8 hr
Analytic Method:	carbon cloth k-filter collection

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from China (non-OECD country) and Japan (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data is for manufacture and dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data after PEL but over 10 years old (1990); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use; however, manufacturing data within acceptable timeframe
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Most metadata described, no information on exposure frequency or worker activities

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Source Citation:	Seiji, K.,Jin, C.,Watanabe, T.,Nakatsuka, H.,Ikeda, M.. 1990. Sister chromatid exchanges in peripheral lymphocytes of workers exposed to benzene, trichloroethylene, or tetrachloroethylene, with reference to smoking habits. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	75419

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hellweg, S.,Demou, E.,Scheringer, M.,McKone, T. E.,Hungerbuhler, K.. 2005. Confronting workplace exposure to chemicals with LCA: examples of trichloroethylene and perchloroethylene in metal degreasing and dry cleaning. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	88147

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor degreasing and dry cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Modeled results provided in bar graphs, additional results available in supporting information
Analytic Method:	Near-field/Far-Field

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from US and Switzerland (OECD Country)
	Metric 3:	Applicability	High	× 2	2	Data for degreasing and dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (2005); includes data for all machine types
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Not described in main report, but additional information may be available in supporting information
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability between mahcine types discussed
Overall Quality Determination†			Medium		1.9	

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Source Citation:	Hellweg, S.,Demou, E.,Scheringer, M.,McKone, T. E.,Hungerbuhler, K.. 2005. Confronting workplace exposure to chemicals with LCA: examples of trichloroethylene and perchloroethylene in metal degreasing and dry cleaning. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	88147

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Solet, D.,Robins, T. G.,Sampaio, C.. 1990. Perchloroethylene exposure assessment among dry cleaning workers. AIHA Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94476

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	workers: 10.67 ppm (mean)ONUS: 5.75 ppm (mean)This is excludes data for transfer machines; Study also presents a summary of exposure data from other studies with ranges from 15-28.2 ppm for workers, and 2.5-5.5 for ONUs
Number of Samples:	11
Number of Sites:	4
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Operators: Load/Unload machines, apply spotters, routine maintenancePresser: Operate pressing macine on cleaned garmentsClerk: Counter dutiesManagerial: Administrative dutiesSeamstress: Mend and alter garment
Number of Workers:	34
Type of Sampling:	PBZ
Exposure Duration:	0.75-8.9

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1990); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						

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Source Citation:	Solet, D.,Robins, T. G.,Sampaio, C.. 1990. Perchloroethylene exposure assessment among dry cleaning workers. AIHA Journal.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94476

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 6: Metadata Completeness	Medium	× 1	2	Sample data fully described except for exposure frequency
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Variability in shop types and machine types discussed
Overall Quality Determination†		Medium		1.7	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cai, S. X.,Huang, M. Y.,Chen, Z.,Liu, Y. T.,Jin, C.,Watanabe, T.,Nakatsuka, H.,Seiji, K.,Inoue, O.,Ikeda, M.. 1991. Subjective symptom increase among dry-cleaning workers exposed to tetrachloroethylene vapor. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94479

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	3.8-94.4 ppm, GM = 19.9 ppm
Number of Samples:	56
Number of Sites:	3
Type of Measurement or Method:	TWA
Number of Workers:	56
Analytic Method:	carbon cloth k-filter collection

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Japan (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1991); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on exposure duration, exposure frequency, sample type, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Cai, S. X.,Huang, M. Y.,Chen, Z.,Liu, Y. T.,Jin, C.,Watanabe, T.,Nakatsuka, H.,Seiji, K.,Inoue, O.,Ikeda, M.. 1991. Subjective symptom increase among dry-cleaning workers exposed to tetrachloroethylene vapor. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94479

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Monster, A.,Regouin-Peeters, W.,Van Schijndel, A.,Van der Tuin, J.. 1983. Biological monitoring of occupational exposure to tetrachloroethene. Scandinavian Journal of Work, Environment and Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94882

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor degreasing and dry cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Dry Cleaning: 190-6,600 ummol/m3Degreasing: 65-125 ummol/m3 (Note: PCE concentration 5 percent in degreasing solvent)
Number of Sites:	Dry cleaning: 3Degreasing: 1
Type of Measurement or Method:	TWA
Number of Workers:	Dry cleaning: 23Degreasing: 9
Type of Sampling:	PBZ
Exposure Duration:	8-hr
Exposure Frequency:	37-54 hr/wk
Analytic Method:	Charcoal tube collection and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Netherlands (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning and degreasing
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data after PEL but over 10 years old (1983); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use; however, degreasing data within acceptable timeframe
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample data fully described except for worker activities

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Source Citation:	Monster, A.,Regouin-Peeters, W.,Van Schijndel, A.,Van der Tuin, J.. 1983. Biological monitoring of occupational exposure to tetrachloroethene. Scandinavian Journal of Work, Environment and Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	94882

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lauwerys, R.,Herbrand, J.,Buchet, J. P.,Bernard, A.,Gaussin, J.. 1983. Health surveillance of workers exposed to tetrachloroethylene in dry-cleaning shops. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	195890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	8.9-37.5 ppm, mean = 20.8
Number of Samples:	26
Number of Sites:	6
Type of Measurement or Method:	TWA
Number of Workers:	26
Type of Sampling:	PBZ
Analytic Method:	NIOSH-type charcoal tube collection and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from Belgium (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1983); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Lauwerys, R.,Herbrand, J.,Buchet, J. P.,Bernard, A.,Gaussin, J.. 1983. Health surveillance of workers exposed to tetrachloroethylene in dry-cleaning shops. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	195890

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echeverria, D.,White, R. F.,Sampaio, C.. 1995. A behavioral evaluation of PCE exposure in patients and dry cleaners: A possible relationship between clinical and preclinical effects. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	195893

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	workers: 11.4 ppmONUs: 0-4.3 ppm
Type of Measurement or Method:	15 min TWA
Number of Workers:	65
Type of Sampling:	PBZ
Engineering Control & percent Exposure Reduction:	general dilution ventilation assited by stand alone fans

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1995); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Low	× 1	3	average provided, other statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on exposure duration, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion on difference between predicted values and measured values
Overall Quality Determination†			Medium		2.0	

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Source Citation:	Echeverria, D.,White, R. F.,Sampaio, C.. 1995. A behavioral evaluation of PCE exposure in patients and dry cleaners: A possible relationship between clinical and preclinical effects. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	195893

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Steinsvag, K.,Bratveit, M.,Moen, B. E.. 2007. Exposure to carcinogens for defined job categories in Norway's offshore petroleum industry, 1970 to 2005. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	524541

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Long term(360min): 4.2-11 mg/m3, GM: 6.9 mg/m3 Short term(10min): 28-177 mg/m3, GM: 50 mg/m3
Number of Samples:	Long: 13Short: 4
Number of Sites:	1
Type of Measurement or Method:	Long term (360 min) and short term (10 min)
Type of Sampling:	PBZ
Sampling Location:	Laundry room on offshore oil and gas drillling rig
Exposure Duration:	10-360min
Analytic Method:	Coal tar tube collection, GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Norway (OECD Country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1990); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities

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Source Citation:	Steinsvag, K.,Bratveit, M.,Moen, B. E.. 2007. Exposure to carcinogens for defined job categories in Norway's offshore petroleum industry, 1970 to 2005. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	524541

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Anttila, A.,Pukkala, E.,Sallmen, M.,Hernberg, S.,Hemminki, K.. 1995. Cancer incidence among Finnish workers exposed to halogenated hydrocarbons. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630313

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing and Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Dry cleaning: Described as "less than the hygenic standard of 50 ppm"Degreasing: "less than the hygenic standard of 30 ppm"
Number of Workers:	2,000

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Finland (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning and degreasing
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data after PEL but over 10 years old (1995); dry cleaning data may be for 1st gen machines (data prior to ban) which are no longer in use; however, degreasing data within acceptable timeframe
	Metric 5:	Sample Size	Low	× 1	3	Only qualitatively described as less than hygenic standards
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	No metadata provided and measurements only described qualitatively as less than standards
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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Source Citation:	Anttila, A.,Pukkala, E.,Sallmen, M.,Hernberg, S.,Hemminki, K.. 1995. Cancer incidence among Finnish workers exposed to halogenated hydrocarbons. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630313

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Brodkin, C. A.,Daniell, W.,Checkoway, H.,Echeverria, D.,Johnson, J.,Wang, K.,Sohaey, R.,Green, D.,Redlich, C.,Gretch, D.. 1995. Hepatic ultrasonic changes in workers exposed to perchloroethylene. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630387

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.4-9.3 ppm, mean: 4.6 ppm (for dry-to-dry only)
Number of Sites:	16
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Loading/unloading machines, and routine maintenance
Number of Workers:	5
Type of Sampling:	PBZ
Exposure Duration:	8-hr
Engineering Control & percent Exposure Reduction:	40-90 percent reduction using LEV, enclosed piping, and cooling condensers
Analytic Method:	NIOSH method

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1995); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on exposure duration, or exposure frequency

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Source Citation:	Brodkin, C. A.,Daniell, W.,Checkoway, H.,Echeverria, D.,Johnson, J.,Wang, K.,Sohaey, R.,Green, D.,Redlich, C.,Gretch, D.. 1995. Hepatic ultrasonic changes in workers exposed to perchloroethylene. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630387

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussion on types of machines used and uncertainties with small sample size taken over a single day
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Eskenazi, B.,Wyrobek, A. J.,Fenster, L.,Katz, D. F.,Sadler, M.,Lee, J.,Hudes, M.,Rempel, D. M.. 1991. A study of the effect of perchloroethylene exposure on semen quality in dry cleaning workers. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630521

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Results from several studies referenced in report, data for dry-to-dry: 3-75.9ppm, mean: 28.2 ppm

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1991); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	No metadata provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

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Source Citation:	Eskenazi, B.,Wyrobek, A. J.,Fenster, L.,Katz, D. F.,Sadler, M.,Lee, J.,Hudes, M.,Rempel, D. M.. 1991. A study of the effect of perchloroethylene exposure on semen quality in dry cleaning workers. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630521

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gobba, F.,Righi, E.,Fantuzzi, G.,Predieri, G.,Cavazzuti, L.,Aggazzotti, G.. 1998. Two-year evolution of perchloroethylene-induced color-vision loss. Archives of Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630562

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.01-23.4 ppm
Number of Samples:	33
Number of Sites:	12
Type of Measurement or Method:	TWA
Number of Workers:	33
Type of Sampling:	PBZ
Exposure Duration:	8-hr
Analytic Method:	GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Italy (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1998); dry cleaning data may be for 1st gen machines which are no longer in use
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						

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Source Citation:	Gobba, F.,Righi, E.,Fantuzzi, G.,Predieri, G.,Cavazzuti, L.,Aggazzotti, G.. 1998. Two-year evolution of perchloroethylene-induced color-vision loss. Archives of Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630562

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussion on variability between two study groups
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruder, A. M.,Ward, E. M.,Brown, D. P.. 1994. Cancer mortality in female and male dry-cleaning workers. Journal of Occupational Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630933

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Referenced study that measured an average of 16 ppm for dry-to-dry

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1994); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Low	× 1	3	average provided, other statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	No metadata provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Schreiber, J. S.,House, S.,Prohonic, E.,Smead, G.,Hudson, C.,Styk, M.,Lauber, J.. 1993. An investigation of indoor air contamination in residences above dry cleaners. Risk Analysis.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630959

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Co-located Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Referenced study that found 85-197,000 ug/m3 in co-located residencies.In co-located residencies: 300-440 um/m3
Number of Sites:	6
Exposure Duration:	24-hr
Engineering Control & percent Exposure Reduction:	Local exhaust and general exhaust described
Analytic Method:	PID and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data after PEL but over 10 years old (1993); includes data for dry-to-dry machines
	Metric 5:	Sample Size	Low	× 1	3	Range given, other statistics not provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on exposure frequency, worker activities, or measurement type
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discussion on variability of home ventilation. Discuss uncertainty in representativeness of data for other co-located buildings

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Source Citation:	Schreiber, J. S.,House, S.,Prohonic, E.,Smead, G.,Hudson, C.,Styk, M.,Lauber, J.. 1993. An investigation of indoor air contamination in residences above dry cleaners. Risk Analysis.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630959

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Solet, D.,Robins, T. G.. 1991. Renal function in dry cleaning workers exposed to perchloroethylene. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630987

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Indicates PBZ samples were taken but does not present results of sampling. Does present results form other studies: Mean of 10 ppm, estimated from urinary trichloroacetic acid; Mean 20.8 ppm (measured PBZ); and Mean of 14 ppm, estimated from linear regression of PCE in breath.
Number of Sites:	14
Type of Measurement or Method:	TWA
Number of Workers:	220
Type of Sampling:	PBZ
Analytic Method:	NIOSH Method S335

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1991); dry cleaning data may be for 1st gen machines which are no longer in use
	Metric 5:	Sample Size	Low	× 1	3	No data provided from this study, averages from other studies provided, but other statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Sample type given, no other metadata provided

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Source Citation:	Solet, D.,Robins, T. G.. 1991. Renal function in dry cleaning workers exposed to perchloroethylene. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630987

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vaughan, T. L.,Stewart, P. A.,Davis, S.,Thomas, D. B.. 1997. Work in dry cleaning and the incidence of cancer of the oral cavity, larynx, and oesophagus. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631120

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Operators: 40 ppm, Pressers and counter workers: 7ppm, Others (including delivery truck driver, book-keeper, and consultant): 3 ppm (Note: Study indicates these values were assigned based on literature)
Type of Measurement or Method:	8-hr TWA
Number of Workers:	Operators: 18, Pressers and counter workers: 16, Others (including delivery truck driver, book-keeper, and consultant): 3

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data after PEL but over 10 years old (1997); dry cleaning data may be for 1st gen machines which are no longer in use
	Metric 5:	Sample Size	Low	× 1	3	Not specified
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Gives exposure for job types based on other lit studies, does not provide other necessary information
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Vaughan, T. L.,Stewart, P. A.,Davis, S.,Thomas, D. B.. 1997. Work in dry cleaning and the incidence of cancer of the oral cavity, larynx, and oesophagus. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631120

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.7.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Verplanke, A. J.,Leummens, M. H.,Herber, R. F.. 1999. Occupational exposure to tetrachloroethene and its effects on the kidneys. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631123

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Seamstresses, folding/packaging, ironing, sorting: GM: <1 mg/m3 Machine Operators: 1.0-221 mg/m3, GM: 7.9 mg/m3
Number of Sites:	4
Type of Measurement or Method:	8-hr TWA, estimated from alveolar samples
Number of Workers:	Seamstresses, folding/packaging, ironing, sorting: 19Machine Operators: 82
Type of Sampling:	Alveolar
Analytic Method:	Estimated from alveolar samples

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Unacceptable	× 1	4	Exposure concentrations estimated from alveolar samples rather than direct measurements
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Netherlands (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1989).
	Metric 5:	Sample Size	Medium	× 1	2	Median and range of results provided, no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	most metadata given, no information on exposure frequency
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of uncertainty/variability

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Source Citation:	Verplanke, A. J.,Leummens, M. H.,Herber, R. F.. 1999. Occupational exposure to tetrachloroethene and its effects on the kidneys. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631123

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Who,. 2006. Concise international chemical assessment document 68: Tetrachloroethene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631155

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	References several studies: dutch Study: 350 mg/m3NIOSH Studies: 30-1030 mg/m3Co-located NYDEP: 0.63-6.2 mg/m3, mean: 2.5 mg/m3
Type of Measurement or Method:	TWA
Type of Sampling:	PBZ

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH study
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Studies from US and other OECD countries
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data collected after PEL, but more than 10 years ago. With the exception of one study, all data referenced was prior to the ban on transfer machines
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure duration, or exposure frequency
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Who,. 2006. Concise international chemical assessment document 68: Tetrachloroethene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631155

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	270 mg/m3
Type of Sampling:	PBZ

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Studies from US and other OECD countries
	Metric 3:	Applicability	High	× 2	2	Data for vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1986).
	Metric 5:	Sample Size	Low	× 1	3	average provided, other statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type provided, no information on exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		2.2	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Who,. 2006. Concise international chemical assessment document 68: Tetrachloroethene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631155

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Other: Printing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	110 mg/m3
Type of Sampling:	PBZ

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Studies from US and other OECD countries
	Metric 3:	Applicability	High	× 2	2	Data for printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data collected after PEL, but more than 10 years ago (1986).
	Metric 5:	Sample Size	Low	× 1	3	average provided, other statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type provided, no information on exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		2.2	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McKernan, L. T.,Ruder, A. M.,Petersen, M. R.,Hein, M. J.,Forrester, C. L.,Sanderson, W. T.,Ashley, D. L.,Butler, M. A.. 2008. Biological exposure assessment to tetrachloroethylene for workers in the dry cleaning industry. Environmental Health: A Global Access Science Source.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	632402

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Mean: 3.15 ppm, GM: 1.64 ppm
Number of Samples:	35
Number of Sites:	4
Type of Measurement or Method:	TWA
Worker Activity:	Operators: Load/unload machinesPressers: Iron and finish garments after washing, served customers
Number of Workers:	18 (15 pressers, 1 full-time operator)
Type of Sampling:	PBZ
Exposure Duration:	120 min sampling period
Analytic Method:	NIOSH 1003

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from 10 years ago for 3rd and fourth gen machines
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Most metadata provided, no information on exposure frequency

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Source Citation:	McKernan, L. T.,Ruder, A. M.,Petersen, M. R.,Hein, M. J.,Forrester, C. L.,Sanderson, W. T.,Ashley, D. L.,Butler, M. A.. 2008. Biological exposure assessment to tetrachloroethylene for workers in the dry cleaning industry. Environmental Health: A Global Access Science Source.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	632402

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Samples taken on multiple days to account for variabality between work days, uncertainty discussed with respect to facility selection
Overall Quality Determination†		High		1.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	von Grote, J.,Hürlimann, C.,Scheringer, M.,Hungerbühler, K.. 2006. Assessing occupational exposure to perchloroethylene in dry cleaning. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	632592

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Model results shown in plots range from 0.345 g/m3-0.0109 g/m3
Type of Measurement or Method:	TWA
Worker Activity:	Desribes operators and ONUs tasks
Number of Workers:	1-6.5 workers per machine7.8 ONUS per shop
Exposure Duration:	8-hr

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Modeling
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Germany (OECD Country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from over 10 years ago (2006) but covers 2nd-5th gen machines
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Modeling results only provided in graphs
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Discuss variability between machine types, and parameter variability in the model
Overall Quality Determination†			Medium		1.8	

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Source Citation:	von Grote, J.,Hürlimann, C.,Scheringer, M.,Hungerbühler, K.. 2006. Assessing occupational exposure to perchloroethylene in dry cleaning. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	632592

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Raisanen, J.,Niemela, R.,Rosenberg, C.. 2001. Tetrachloroethylene emissions and exposure in dry cleaning. Journal of the Air and Waste Management Association.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	671474

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Operators at industrial plant: mean: 9.7 mg/m3Overall Operators: 9-50 mg/m3Pressers at industrial plant: mean: 3.4 mg/m3Presser at commercial plant: mean: 7.7mg/m3Customer service: 0.8 mg/m3Short-term: 34-2300 mg/m3Also referenced a study that measured mean exposure as 190 mg/m3, one study that measured 88-130 mg/m3, and one study that measured 17-400 mg/m3
Number of Sites:	6, number of machines was 1-4 per shop
Type of Measurement or Method:	TWA and short-term
Worker Activity:	operators, assistant operators, and pressers
Number of Workers:	13-Feb
Type of Sampling:	PBZ and area
Engineering Control & percent Exposure Reduction:	Mechanical air supply and exhaust systems, local exhuast hoods, underpressurized washing drumsHoods captured 85 percent
Analytic Method:	NIOSH 1003

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Finland (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from over 10 years ago (2001) but covers current machine types
	Metric 5:	Sample Size	Low	× 1	3	Number of samples not provided, range and averages given

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Source Citation:	Raisanen, J.,Niemela, R.,Rosenberg, C.. 2001. Tetrachloroethylene emissions and exposure in dry cleaning. Journal of the Air and Waste Management Association.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	671474

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	Provides measurement and sample types, but does not provide exposure duration or frequency
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Discusses variability between shop types
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Johansen, K.,Tinnerberg, H.,Lynge, E.. 2005. Use of history science methods in exposure assessment for occupational health studies. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	699212

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	18-1831 mg/m3 (range of means from data taken from 1947-1987)
Number of Samples:	86
Number of Sites:	37
Type of Measurement or Method:	TWA

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Denmark (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from over 20 years ago; however, Denmark banned transfer machines in the 1953, per source. Therefore post-1953 exposure data may be relevant to current US conditions
	Metric 5:	Sample Size	Medium	× 1	2	Number of samples, average, min and max provided for each year studied; however discrete samples and overall statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Only measurement type given, no information on exposure durations, worker exposures, sample type provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability between shop sizes and machine types discussed

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Source Citation:	Johansen, K.,Tinnerberg, H.,Lynge, E.. 2005. Use of history science methods in exposure assessment for occupational health studies. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	699212

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

⋆⋆ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gulyas, H.,Hemmerling, L.. 1990. Tetrachloroethene air pollution originating from coin-operated dry cleaning establishments. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	713690

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Referenced a study with 25-250 ppm at coin-operated dry cleanersReferenced a study with 286 mg/m3 at coin-operated dry cleaners6.4-331 mg/m3
Number of Sites:	15
Type of Measurement or Method:	short-term
Type of Sampling:	area
Sampling Location:	1m height and a distance of 1m from machine
Analytic Method:	NIOSH sampling tubes and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from two OECD Countries (Germany and Denmark)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from over 20 years ago (1990) but some data covers current machine types
	Metric 5:	Sample Size	Low	× 1	3	Multiple values given for each site sampled; however, study does not specify if these are min, max, average, or result from a single data point
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Provides measurement and sample types, but does not provide exposure duration or frequency, worker activities, or the number of samples taken at each site.

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Source Citation:	Gulyas, H.,Hemmerling, L.. 1990. Tetrachloroethene air pollution originating from coin-operated dry cleaning establishments. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	713690

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Adddressed variability between machine types at each shop and uncertainty of results to predict differences between machine types due to variability within each shop
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.9.

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lynge, E.,Tinnerberg, H.,Rylander, L.,Romundstad, P.,Johansen, K.,Lindbohm, M. L.,Heikkilä, P.,Westberg, H.,Clausen, L. B.,Piombino, A.,Thorsted, B. L.. 2011. Exposure to tetrachloroethylene in dry cleaning shops in the Nordic countries. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	716622

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Referenced international study that indicated a drop of PCE exposure of 50-100 ppm to 10-50 ppm from the 1970s to the 1980s, and references a study that preformed a NIOSH review indicating an average exposure of 57 ppm (data from 1936-2001).PBZ: 95 percent CI: 6.78-7.79 ppmArea: 95 percent CI: 10.66-13.51 ppm
Number of Samples:	687 (PBZ)609 (area)
Worker Activity:	Cleaning, assistant, maintenance, other
Type of Sampling:	PBZ and area
Sampling Location:	66 percent in the cleaning area

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from several OECD Countries (Finland, Norway, Sweden, and Denmark), some US data provided
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data from over 20 years ago and includes data from both pre-ban and post-ban on transfer machines; however, this study compiles all data together and does not differentiate between the years
	Metric 5:	Sample Size	Medium	× 1	2	Ranges and medians provided for PBZ and area samples, discrete samples not provided
Domain 3: Accessibility/Clarity						

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Source Citation:	Lynge, E.,Tinnerberg, H.,Rylander, L.,Romundstad, P.,Johansen, K.,Lindbohm, M. L.,Heikkilä, P.,Westberg, H.,Clausen, L. B.,Piombino, A.,Thorsted, B. L.. 2011. Exposure to tetrachloroethylene in dry cleaning shops in the Nordic countries. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	716622

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Unacceptable	× 1	4	Sample types and worker activities provided, no data on measurement types, exposure duration or frequency.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Addressed variability between years, and uncertainties is the data collected from other studies.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

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★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Guo, H.,Lee, S. C.,Chan, L. Y.,Li, W. M.. 2004. Risk assessment of exposure to volatile organic compounds in different indoor environments. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	758690

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Office (type not specified)
Physical Form:	Vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.01 ug/m3
Number of Samples:	6
Type of Measurement or Method:	8hr-TWA

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	methodology described but is not equivalent to OSHA/NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from China
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for "offices", offices not in scope for this assessment.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data older than 10 years and after PEL
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.7.

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Source Citation:	Guo, H.,Lee, S. C.,Chan, L. Y.,Li, W. M.. 2004. Risk assessment of exposure to volatile organic compounds in different indoor environments. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	758690

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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* MWF = Metric Weighting Factor

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source 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 and Environmental Engineering.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	832709

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Hot/Cold Forming in Steel Plant
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Cold forming: Mean: 37 ppbHot forming: Mean: 84 ppb10th, 50th, and 90th percent tiles also given for each process
Number of Samples:	36
Number of Sites:	1
Type of Sampling:	area
Sampling Location:	1 m from equipment
Exposure Duration:	4 hr
Exposure Frequency:	250 day/yr (reference to EPA value)
Analytic Method:	US EPA Method TO-14, GC/MS analysis, Modeled distribution using Crystal Ball 2000.2

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from China (non-OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for cold/hot-forming (other use)
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						

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Source 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 and Environmental Engineering.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	832709

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Low	× 1	3	Measurement type and worker activities not provided, all other metadata present (note: for exposure frequency, study references EPA's default value)
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†		Medium		1.8	

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Source Citation:	Sweet, N. D.,Burroughs, G. E.,Ewers, L.,Talaska, G.. 2004. A field method for near real-time analysis of perchloroethylene in end-exhaled breath. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1066803

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.94-5.54 ppm in exhaled breath
Analytic Method:	NIOSH 1003

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Unacceptable	× 1	4	Exposure concentrations estimated from exhaled breath samples rather than direct measurements
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data older than 10 years and after PEL
	Metric 5:	Sample Size	Medium	× 1	2	Median and range of results provided, no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of uncertainty/variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.9.

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Source Citation:	Sweet, N. D.,Burroughs, G. E.,Ewers, L.,Talaska, G.. 2004. A field method for near real-time analysis of perchloroethylene in end-exhaled breath. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1066803

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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* MWF = Metric Weighting Factor

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gromiec, J. P.,Wesolowski, W.,Brzeznicki, S.,Wroblewska-Jakubowska, K.,Kucharska, M.. 2002. Occupational exposure to rubber vulcanization products during repair of rubber conveyor belts in a brown coal mine. Journal of Environmental Monitoring.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1597971

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Adhesive
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.1-5.5 mg/m3
Number of Samples:	13
Number of Sites:	1
Type of Sampling:	PBZ
Sampling Location:	repair shop work area
Exposure Duration:	more than 360 min.
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Poland (OECD country)
	Metric 3:	Applicability	High	× 2	2	Adhesive use
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from > 10 years but < 20 years (2002)
	Metric 5:	Sample Size	Medium	× 1	2	range and average statistics provided, discrete sampling results not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide sample duration or worker activity exposure duration
Domain 4: Variability and Uncertainty						

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Source Citation:	Gromiec, J. P.,Wesolowski, W.,Brzeznicki, S.,Wroblewska-Jakubowska, K.,Kucharska, M.. 2002. Occupational exposure to rubber vulcanization products during repair of rubber conveyor belts in a brown coal mine. Journal of Environmental Monitoring.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1597971

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussed variability between job types
Overall Quality Determination†		Medium		1.8	

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Source Citation:	SanjuÃ¡n-HerrÃ¡ez, D.,Lliso, I.,Pastor, A.,de la Guardia, M.. 2012. Green determination of the presence of volatile organic compounds in vehicle repair shops through passive sampling. Talanta.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1787870

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vehicle repair
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.11-2.9 mg/m3 (172 mg/m3 TWA)
Number of Sites:	1
Type of Measurement or Method:	long-term
Type of Sampling:	area
Sampling Location:	washing area, working area, warehouse, painting area
Exposure Duration:	8-96 hr
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Spain (OECD country)
	Metric 3:	Applicability	Unacceptable	× 2	8	Use of PCE not described, unclear if applicable to any COU
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Sample type given, but not enough metadata to identify use of PERC at the site
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of uncertainty/variability

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Source Citation:	SanjuÃ¡n-HerrÃ¡ez, D.,Lliso, I.,Pastor, A.,de la Guardia, M.. 2012. Green determination of the presence of volatile organic compounds in vehicle repair shops through passive sampling. Talanta.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1787870

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Rastkari, N.,Yunesian, M.,Ahmadkhaniha, R.. 2011. Exposure Assessment to Trichloroethylene and Perchloroethylene for Workers in the Dry Cleaning Industry. Bulletin of Environmental Contamination and Toxicology.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2128295

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	31.04-120.99 mg/m3
Number of Samples:	30
Type of Sampling:	PBZ
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Iran (non-OECD)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2011)
	Metric 5:	Sample Size	Low	× 1	3	Only mean from 3 separate sampling events provided, range and discrete samples not provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type provided, no information on measurement type, exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability due to laundry load size discussed
Overall Quality Determination†			Medium		1.9	

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Source Citation:	Rastkari, N.,Yunesian, M.,Ahmadkhaniha, R.. 2011. Exposure Assessment to Trichloroethylene and Perchloroethylene for Workers in the Dry Cleaning Industry. Bulletin of Environmental Contamination and Toxicology.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2128295

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

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Source Citation:	Everatt, R.,SlapÅ¡ytÄ, G.,MierauskienÄ, J.,DedonytÄ, V.,BakienÄ, L.. 2013. Biomonitoring study of dry cleaning workers using cytogenetic tests and the comet assay. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2546715

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Operator: 38.12 mg/m3 (average), 63.52 mg/m3 (max)Presser: 35.76 mg/m3 (average), 52.54 mg/m3 (max)Clerk: 44.42 mg/m3 (average), 52.42 mg/m3 (max)Admin: 6.52 mg/m3 (average), 13.12 mg/m3 (max)
Number of Sites:	6
Type of Measurement or Method:	TWA
Worker Activity:	Machine operators, pressers, counter clerk, administrator
Number of Workers:	30
Type of Sampling:	PBZ
Exposure Duration:	8-hr
Analytic Method:	GC

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Lithuania (non-OECD)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2013)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given

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Source Citation:	Everatt, R.,SlapÅ¡ytÄ, G.,MierauskienÄ, J.,DedonytÄ, V.,BakienÄ, L.. 2013. Biomonitoring study of dry cleaning workers using cytogenetic tests and the comet assay. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2546715

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussed variability between job types
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Stefaniak, A. B.,Breysse, P. N.,Murray, M. P. M.,Rooney, B. C.,Schaefer, J.. 2000. An evaluation of employee exposure to volatile organic compounds in three photocopy centers. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1953674

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Photocopier Chemicals
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	PBZ: 0.1-0.5 ppb (average), area: 0.1-3.2 ppb (average)
Number of Samples:	21 (4 personal, 17 area)
Number of Sites:	3
Type of Measurement or Method:	TWA
Worker Activity:	photocopier operator, area sample was area room from copier, center of room, and under feed tray
Type of Sampling:	PBZ & area
Sampling Location:	Photo copy centers
Analytic Method:	US EPA Method 1P-1B with GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Photocopier Toner powder (similar to ink)
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from > 10 years but < 20 years (2000)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide sample duration or worker activity exposure duration

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Source Citation:	Stefaniak, A. B.,Breysse, P. N.,Murray, M. P. M.,Rooney, B. C.,Schaefer, J.. 2000. An evaluation of employee exposure to volatile organic compounds in three photocopy centers. Environmental Research.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1953674

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Discussed variability between copier locations
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Zare Sakhvidi, M. J.,Bahrami, A. R.,Ghiasvand, A.,Mahjub, H.,Tuduri, L.. 2013. SPME-based air sampling method for inhalation exposure assessment studies: case study on perchlorethylene exposure in dry cleaning. Environmental Monitoring and Assessment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2559016

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-5 ppmv
Number of Samples:	40
Number of Sites:	1
Type of Measurement or Method:	TWA
Worker Activity:	machine operator
Type of Sampling:	PBZ & area
Sampling Location:	dry cleaner using second generation dry-to-dry vented machine
Exposure Duration:	230-310 min.
Analytic Method:	NIOSH 1003 with GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for 2nd generation dry cleaning machines which are outdated and being phased out
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide worker activity or worker exposure duration

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Source Citation:	Zare Sakhvidi, M. J.,Bahrami, A. R.,Ghiasvand, A.,Mahjub, H.,Tuduri, L.. 2013. SPME-based air sampling method for inhalation exposure assessment studies: case study on perchlorethylene exposure in dry cleaning. Environmental Monitoring and Assessment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2559016

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample duration and calculated standard deviation and reproducibility of results
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.8.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tucker, J. D.,Sorensen, K. J.,Ruder, A. M.,McKernan, L. T.,Forrester, C. L.,Butler, M. A.. 2011. Cytogenetic analysis of an exposed-referent study: perchloroethylene-exposed dry cleaners compared to unexposed laundry workers. Environmental Health: A Global Access Science Source.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2576781

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	TWA: 0-9.1 ppm, breath:0.34-2.08 ppm, blood:01-179.08 "g/l
Number of Sites:	3
Type of Measurement or Method:	TWA, breath, and blood
Worker Activity:	machine operator and presser
Number of Workers:	18
Type of Sampling:	PBZ & area
Sampling Location:	dry cleaner using third generation machines containing only refrigerated condensers or fourth generation machines with refrigerated condensers and carbon adsorbers
Analytic Method:	NIOSH Method 3704 with GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH method used
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2011)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						

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Source Citation:	Tucker, J. D.,Sorensen, K. J.,Ruder, A. M.,McKernan, L. T.,Forrester, C. L.,Butler, M. A.. 2011. Cytogenetic analysis of an exposed-referent study: perchloroethylene-exposed dry cleaners compared to unexposed laundry workers. Environmental Health: A Global Access Science Source.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2576781

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, and worker activity, but does not provide worker exposure duration
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Demou, E.,Hellweg, S.,Wilson, M. P.,Hammond, S. K.,McKone, T. E.. 2009. Evaluating indoor exposure modeling alternatives for LCA: A case study in the vehicle repair industry. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	2591566

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vehicle Repair aerosol sprays
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	aerosol does not contain PERC
Number of Sites:	3
Number of Workers:	9
Type of Sampling:	PBZ & area
Analytic Method:	GC

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	model appears to be free of errors and based on sound approaches
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	aerosol degreasing use
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2009)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	equation and parameter values, rationale for selection not provided for all parameters
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability and uncertainty addressed through different modeling schemes
Overall Quality Determination†			High		1.3	

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Source Citation:	Demou, E.,Hellweg, S.,Wilson, M. P.,Hammond, S. K.,McKone, T. E.. 2009. Evaluating indoor exposure modeling alternatives for LCA: A case study in the vehicle repair industry. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	2591566

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Chang, C. C.,Lo, G. G.,Tsai, C. H.,Wang, J. L.. 2001. Concentration variability of halocarbons over an electronics industrial park and its implication in compliance with the Montreal protocol. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2773680

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Electronics manufacturing
Physical Form:	vapor
Route of Exposure:	inhalation
Number of Samples:	43
Number of Sites:	1
Worker Activity:	random air sampling in electronics industrial park
Type of Sampling:	area
Sampling Location:	1 in-situ GC/ECD in a trailer with an air inlet extruding the trailer top and 42 flask samples randomly collected throughout the electronic manufacturing facility
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Taiwan (non-OECD)
	Metric 3:	Applicability	Unacceptable	× 2	8	Samples collected from area outside of industrial park containing several electronics manufacturers. Outside samples not relevant to occupational exposures.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from > 10 years but < 20 years (2001)
	Metric 5:	Sample Size	Medium	× 1	2	Number of samples, average, min and max provided for each year studied; however discrete samples and overall statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide sample duration or worker activity exposure duration
Domain 4: Variability and Uncertainty						

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Source Citation:	Chang, C. C.,Lo, G. G.,Tsai, C. H.,Wang, J. L.. 2001. Concentration variability of halocarbons over an electronics industrial park and its implication in compliance with the Montreal protocol. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2773680

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Jo, W. K.,Kim, S. H.. 2001. Worker exposure to aromatic volatile organic compounds in dry cleaning stores. AIHAJ.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2858481

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	3.0 - 4212 "g/m3
Number of Sites:	57
Type of Measurement or Method:	TWA and breath
Type of Sampling:	PBZ
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Korea (OECD country)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from > 10 years but < 20 years (1999)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide sample duration or worker activity exposure duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†			High		1.4	

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Source Citation:	Jo, W. K.,Kim, S. H.. 2001. Worker exposure to aromatic volatile organic compounds in dry cleaning stores. AIHAJ.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2858481

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1997. Control of health and safety hazards in commercial drycleaners: chemical exposures, fire hazards, and ergonomic risk factors.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3044963

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0 - 21.6 ppm
Number of Samples:	45 (does not count transfer machine data)
Number of Sites:	10
Type of Measurement or Method:	TWA
Worker Activity:	machine operator, presser, and spotter
Type of Sampling:	PBZ & area
Sampling Location:	transfer and dry-to-dry, vented and nonvented, and modern machines equipped with various vapor recovery devices. Samples taken in front of and behind machines, in the pressing area, in the spotting area, waste area, customer area, and outside the building
Exposure Duration:	area:120 min personal: 2 hr consecutive samples for a full shift
PPE:	"All of the shops studied had respirators; however, most respirators were not properly maintained and were seldom used. "

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data are from after latest PEL establishment but more than 10 years old (1997)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						

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Source Citation:	Niosh,. 1997. Control of health and safety hazards in commercial drycleaners: chemical exposures, fire hazards, and ergonomic risk factors.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3044963

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.2	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Von Grote, J.,J. C. Hurlimann,Scheringer, M.,Hungerbuhler, K.. 2003. Reduction of Occupational Exposure to Perchloroethylene and Trichloroethylene in Metal Degreasing over the Last 30 years: Influence of Technology Innovation and Legislation. Journal of Exposure Analysis and Environmental Epidemiology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	3045042

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Metal Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-116.4 ppm
Type of Measurement or Method:	TWA
Type of Sampling:	PBZ & area
Analytic Method:	two-box concentration method with literature emission factor for varying machine types

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Germany (OECD country)
	Metric 3:	Applicability	High	× 2	2	Degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from > 10 years but < 20 years (2003)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	model aproach, equations, and choice of parameters are clear. Rationale for parameters is provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Discussed variability and uncertainty of results but does not quantify variability or compare to real data

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Source Citation:	Von Grote, J.,J. C. Hurlimann,Scheringer, M.,Hungerbuhler, K.. 2003. Reduction of Occupational Exposure to Perchloroethylene and Trichloroethylene in Metal Degreasing over the Last 30 years: Influence of Technology Innovation and Legislation. Journal of Exposure Analysis and Environmental Epidemiology.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	3045042

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gomez, M. R.. 1997. Factors associated with exposure in occupational safety and health administration data. American Industrial Hygiene Association Journal.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	3382426

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	19-83 mg/m3
Number of Samples:	137
Number of Sites:	87
Type of Measurement or Method:	TWA
Worker Activity:	machine operator, washer, cleaner
Analytic Method:	model 1: mean of establishment means model 2: Linear regression of individual means model 3: generalized estimating equations

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA analysis of OSHA data
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1997)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	model aproach, equations, and choice of parameters are clear. Rationale for parameters is provided, however, does not show quantitative results.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discussed variability and uncertainty of results

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Source Citation:	Gomez, M. R.. 1997. Factors associated with exposure in occupational safety and health administration data. American Industrial Hygiene Association Journal.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	3382426

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lucas, D.,HervÃ©, A.,Lucas, R.,Cabioch, C.,Capellmann, P.,Nicolas, A.,Bodenes, A.,Jegaden, D.. 2015. Assessment of Exposure to Perchloroethylene and its Clinical Repercussions for 50 Dry-Cleaning Employees. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3488665

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.22-33 ppm
Number of Samples:	50
Number of Sites:	22
Type of Measurement or Method:	TWA and blood
Worker Activity:	machine operators of 4th gen. machines, unloading/loading, stain removal
Type of Sampling:	PBZ
Exposure Duration:	3.3 - 10 hr
Analytic Method:	PERC levels in passive diffusion badge and blood sampling determined by GC

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	France (OECD country)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2015)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						

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Source Citation:	Lucas, D.,HervÃ©, A.,Lucas, R.,Cabioch, C.,Capellmann, P.,Nicolas, A.,Bodenes, A.,Jegaden, D.. 2015. Assessment of Exposure to Perchloroethylene and its Clinical Repercussions for 50 Dry-Cleaning Employees. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3488665

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Rutkiewicz, I.,Jakubowska, N.,Polkowska, Z.,NamieÅnik, J.. 2011. Monitoring of occupational exposure to volatile organohalogen solvents (VOXs) in human urine samples of dry-cleaner workers by TLHS-DAI-GC-ECD procedure. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3489826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-30.1 "g/l
Number of Samples:	250
Number of Sites:	7
Type of Measurement or Method:	urine
Worker Activity:	machine operators, unwashed clothes store, washed clothes store
Number of Workers:	25
Type of Sampling:	urine
Exposure Duration:	4 hrs
Analytic Method:	sample first refined by continuous flow TLHS analysis with autogenous generation of the liquid sorbent then analyzed with DAI-GC-ECD

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Unacceptable	× 1	4	exposure is based on urine samples which EPA does not use in risk evaluations
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Poland (OECD country)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2009)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given

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Source Citation:	Rutkiewicz, I.,Jakubowska, N.,Polkowska, Z.,NamieÅnik, J.. 2011. Monitoring of occupational exposure to volatile organohalogen solvents (VOXs) in human urine samples of dry-cleaner workers by TLHS-DAI-GC-ECD procedure. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3489826

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tdh,. 2015. Health consultation: Evaluation of indoor air sampling events, former Walker Machine Products, Collierville, Shelby County, Tennessee, July 28, 2015.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3490993

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	onsite contaminated sub-slab soil and groundwater
Physical Form:	Vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-77 "g/m3 (adjusted for shift work but based on air sampling)
Number of Samples:	7
Number of Sites:	1
Worker Activity:	wire filter cloth manufacture
Number of Workers:	15
Type of Sampling:	area
Exposure Duration:	10 hr

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Tennessee Department of Health
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Exposure from vapor intrusion, not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2014/15)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only sample type and sample duration provided, no information on measurement type, exposure duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed

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Source Citation:	Tdh,. 2015. Health consultation: Evaluation of indoor air sampling events, former Walker Machine Products, Collierville, Shelby County, Tennessee, July 28, 2015.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3490993

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Furuki, K.,Ukai, H.,Okamoto, S.,Takada, S.,Kawai, T.,Miyama, Y.,Mitsuyoshi, K.,Zhang, Z. W.,Higashikawa, K.,Ikeda, M.. 2000. Monitoring of occupational exposure to tetrachloroethene by analysis for unmetabolized tetrachloroethene in blood and urine in comparison with urinalysis for trichloroacetic acid. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3544276

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	automated, continuous cloth-degreasing operations
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	air: 0-46ppm, blood: 0-3262 "g/l, urine: 0-422 "g/l
Number of Sites:	1
Type of Measurement or Method:	TWA, blood and urine
Worker Activity:	using solvent to remove greasy material from cloth
Number of Workers:	44
Type of Sampling:	PBZ
Exposure Duration:	8h/day
Analytic Method:	air: FID-GC Urine & blood: HS-GC or automated methylation followed by HS-GC

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan
	Metric 3:	Applicability	Unacceptable	× 2	8	Condition of use unclear
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (1999)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given

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Source Citation:	Furuki, K.,Ukai, H.,Okamoto, S.,Takada, S.,Kawai, T.,Miyama, Y.,Mitsuyoshi, K.,Zhang, Z. W.,Higashikawa, K.,Ikeda, M.. 2000. Monitoring of occupational exposure to tetrachloroethene by analysis for unmetabolized tetrachloroethene in blood and urine in comparison with urinalysis for trichloroacetic acid. International Archives of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3544276

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.9.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Baya, M. P.,Figa-Talamanca, I.,Siskos, P. A.. 1998. Determination of selected volatile organic compounds in the air of dry-cleaning shops in the Athens area: Pilot study. Indoor and Built Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3545708

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-92.1 mg/m3
Number of Samples:	19
Number of Sites:	19
Type of Measurement or Method:	TWA
Type of Sampling:	PBZ & area
Exposure Duration:	30 min
Analytic Method:	adsorpotion tubes analyzed by TD/GC/FID

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Greece
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from 20 years ago (1998)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						

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Source Citation:	Baya, M. P.,Figa-Talamanca, I.,Siskos, P. A.. 1998. Determination of selected volatile organic compounds in the air of dry-cleaning shops in the Athens area: Pilot study. Indoor and Built Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3545708

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Moschandreas, D. J.,Odea, D. S.. 1995. MEASUREMENT OF PERCHLOROETHYLENE INDOOR AIR LEVELS CAUSED BY FUGITIVE EMISSIONS FROM UNVENTED DRY-TO-DRY DRY-CLEANING UNITS. Journal of the Air and Waste Management Association (1990-1992).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3559276

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1.7 - 52.3 ppm
Number of Samples:	46
Number of Sites:	6
Worker Activity:	Dry-to-dry machine operators
Type of Sampling:	area
Exposure Duration:	1-1.5 hrs (depended on dry cleaning duration)
Analytic Method:	150-mg charcoal tubes and subsequently conducting gas chromatograph analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2012)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						

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Source Citation:	Moschandreas, D. J.,Odea, D. S.. 1995. MEASUREMENT OF PERCHLOROETHYLENE INDOOR AIR LEVELS CAUSED BY FUGITIVE EMISSIONS FROM UNVENTED DRY-TO-DRY DRY-CLEANING UNITS. Journal of the Air and Waste Management Association (1990-1992).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3559276

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Pirsaraei, S. R. A.,Khavanin, A. li,Asilian, H.,Soleimanian, A.. 2009. Occupational Exposure to Perchloroethylene in Dry-cleaning Shops in Tehran, Iran. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3559570

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-132.3 ppm
Number of Samples:	179
Number of Sites:	69
Type of Measurement or Method:	8 hour TWA
Worker Activity:	machine operator, presser and counter area
Number of Workers:	179
Type of Sampling:	PBZ
Analytic Method:	NIOSH Method 1003

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Iran (non-OECD)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from 10 years ago (2008)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						

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Source Citation:	Pirsaraei, S. R. A.,Khavanin, A. li,Asilian, H.,Soleimanian, A.. 2009. Occupational Exposure to Perchloroethylene in Dry-cleaning Shops in Tehran, Iran. Industrial Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3559570

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation and reproducibility of results
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Keen, C.,Dabill, D. W.,Groves, J. A.. 1996. On-site monitoring of personal exposure to tetrachloroethylene at dry cleaning establishments. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3566695

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	25-100 ppm
Number of Samples:	6
Type of Measurement or Method:	short-term and TWA
Worker Activity:	measured PERC concentrations
Type of Sampling:	area
Exposure Duration:	4 and 8 hours
Analytic Method:	CS2 extraction and GC analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	United Kingdom (OECD country)
	Metric 3:	Applicability	Low	× 2	6	non-occupational scenario, but sampling methods used in typical monitoring data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Machine type not specified and prior to ban on transfer mahcines
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						

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Source Citation:	Keen, C.,Dabill, D. W.,Groves, J. A.. 1996. On-site monitoring of personal exposure to tetrachloroethylene at dry cleaning establishments. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3566695

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Discussed variability between sample results and calculated standard deviation
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Thompson, K. M.,Evans, J. S.. 1997. The Value of Improved National Exposure Information for Perchloroethylene (Perc): A Case Study for Dry Cleaners. Risk Analysis.
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	3567478

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-100 ppm
Type of Measurement or Method:	TWA
Worker Activity:	operators and non-operators

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	used International Fabricare Institute data
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1995)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	the model discusses areas of variability and uncertainty but notes it did not include these in the current model
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nicnas,. 2001. Tetrachloroethylene " Priority existing chemical. Assessment Report No. 15.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3797979

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Physical Form:	Liquid/vapor

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Report from NICNAS, expected to use high quality data
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia (OECD country)
	Metric 3:	Applicability	High	× 2	2	has information on multiple in scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2001)
	Metric 5:	Sample Size	Medium	× 1	2	data generally characterized by means with no other statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type and measurement type given, no other statistics provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of variability/uncertainty
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1.2 - 1934 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Machine type not specified and prior to ban on transfer mahcines
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-538 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Aerosol packing: 71-201 mg/m3Paints and Coatings: 1 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Formulation
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Paints and Coatings
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-45 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Paints and Coating
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Intermediates
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-455 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Intermediates
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Coolant/lubricant
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-87 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	coolants/lubricants
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Printing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.8-131 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Welding
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	20 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	welding
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Electronics
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-73 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	electronics
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Photographic film
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	7-421 mg/m3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	photographic film
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	No information on sampling, exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Love, J. R.,Kern, M.. 1981. Health hazard evaluation report no. HETA-81-065-938, METRO Bus Maintenance Shop, Washington, DC.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3859376

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Painting in a bus maintenance shop
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	non-detectable amounts
Number of Samples:	33
Number of Sites:	4
Type of Sampling:	PBZ and area
Exposure Duration:	40-50 minutes
Analytic Method:	NIOSH Method P&CAM 127

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Painting
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1980)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	No information on exposure frequency, or worker activities
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Love, J. R.,Kern, M.. 1981. Health hazard evaluation report no. HETA-81-065-938, METRO Bus Maintenance Shop, Washington, DC.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3859376

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Haz, Map. 2017. Haz-Map: Agent name: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970258

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning and degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Dry Cleaning: 150 ppmDegreasing: 95 ppm
Worker Activity:	Dry cleaning: transfer of wet garments to dryer

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	General method described for sampling and analysis but no specific procedure listed
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Unknown country
	Metric 3:	Applicability	High	× 2	2	Dry cleaning and degreasing data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Unknown date, dry cleaning data for transfer machines
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	No metadata provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.8.

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Source Citation:	Haz, Map. 2017. Haz-Map: Agent name: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970258

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2007. Health consultation: Evaluation of follow-up indoor air sampling results (January " March 2007) at the Washington Traffic Safety Commission offices TMC cleaners (aka Howard"s Cleaners and Olympia Cleaners) Olympia, Thurston County, Washington: EPA facility ID: WAH000017277.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970403

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	<0.61-39 ug/m3
Number of Samples:	13

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ATSDR report
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for office building from vapor intrusion
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type and measurement type given, no other statistics provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.0.

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Source Citation:	Atsdr,. 2007. Health consultation: Evaluation of follow-up indoor air sampling results (January " March 2007) at the Washington Traffic Safety Commission offices TMC cleaners (aka Howard"s Cleaners and Olympia Cleaners) Olympia, Thurston County, Washington: EPA facility ID: WAH000017277.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970403

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Reh, B. D.. 1995. Health hazard evaluation report no. HETA-94-0298, Gen Corp Automotive, Wabash, Indiana.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970466

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	vehicle painting
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	not quantifiable, only indicated chemical was present
Number of Sites:	1
Type of Sampling:	PBZ and area
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Painting
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1995)
	Metric 5:	Sample Size	Low	× 1	3	range of exposure and discrete sample data not provided, focus was not PERC
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Only measurement type provided, no information on exposure duration, or sample duration, etc.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tapp, L.,Sussell, A.. 2008. Health hazard evaluation report no. HETA 2007-0055-3073, Evaluation of employee exposures in a bus maintenance shop, Huntingon Coach Corporation, Huntington Station, New York.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970528

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Brake Cleaner
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	not quantifiable, only indicated chemical was present
Number of Sites:	1

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Brake Cleaner
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from 10 years ago (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - qualitative information only
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gorman, R.,Rinsky, R.,Stein, G.,Anderson, K.. 1984. Health hazard evaluation report no. HETA 82-075-1545, Pratt and Whitney Aircraft, West Palm Beach, Florida.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970552

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	long term: 0.8 - 7.2 ppm, short term: 1.9 - 66.4 ppm, area: < 1.2 ppm
Number of Sites:	1
Type of Measurement or Method:	long term, short term, urine, blood
Worker Activity:	Degreasing on the A-line in the plating area
Number of Workers:	29 workers and 11 areas
Type of Sampling:	PBZ and area
Exposure Duration:	long term: 8 hours, short term: only activated when that person was operating a vapor degreaser
Analytic Method:	NIOSH Method P&CAM 127

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1995)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide total samples, or worker exposure duration

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Source Citation:	Gorman, R.,Rinsky, R.,Stein, G.,Anderson, K.. 1984. Health hazard evaluation report no. HETA 82-075-1545, Pratt and Whitney Aircraft, West Palm Beach, Florida.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970552

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty but does not include calculated values in the report
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Weber, A. M.,Hurrell, J. J., Jr.,Moss, C. E.. 1993. Health hazard evaluation report no. HETA 92-0316-2339 Washington Metropolitan Area Transit Authoirty, Washington D.C.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970557

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Bus Maintenance
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.004 mg/m3
Number of Sites:	6
Type of Sampling:	area
Exposure Duration:	5 hours
Analytic Method:	GC-MS

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US data
	Metric 3: Applicability	Unacceptable	× 2	8	Use of PCE not described
	Metric 4: Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1992)
	Metric 5: Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide total samples, or worker exposure duration
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty but does not include calculated values in the report

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Source Citation:	Weber, A. M.,Hurrell, J. J., Jr.,Moss, C. E.. 1993. Health hazard evaluation report no. HETA 92-0316-2339 Washington Metropolitan Area Transit Authoirty, Washington D.C.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970557

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Seitz, T.,Driscoll, R.. 1989. Health hazard evaluation report no. HETA 88-082-1971, Jostens Incorporated, Princeton, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970562

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Paint and Coatings (jewlery lacquer)
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0-2ppm
Number of Samples:	11
Worker Activity:	metal plating, polishing, cleaning
Type of Sampling:	PBZ and area
Analytic Method:	GC-FID method NIOSHMethods 1003, 1300, and 1501

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1989)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide total samples, or worker exposure duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty but does not include calculated values in the report
Overall Quality Determination†			High		1.4	

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Source Citation:	Seitz, T.,Driscoll, R.. 1989. Health hazard evaluation report no. HETA 88-082-1971, Jostens Incorporated, Princeton, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970562

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Broadwater, K.,Brueck, S. E.,Nourian, F.,Roberts, J.,Oza, A. Y.. 2016. Health hazard evaluation report no. HHE 2013-0117-3247, Evaluation of odors and surface resideus in a medical center research facility.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970565

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	unknown
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	trace levels
Number of Sites:	1
Worker Activity:	office building/laboratory
Type of Sampling:	area
Sampling Location:	office/laboratory

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	unknown use of PCE
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2013)
	Metric 5:	Sample Size	Low	× 1	3	distribution not characterized by statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources generally described, some details missing
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Broadwater, K.,Brueck, S. E.,Nourian, F.,Roberts, J.,Oza, A. Y.. 2016. Health hazard evaluation report no. HHE 2013-0117-3247, Evaluation of odors and surface resideus in a medical center research facility.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970565

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gunter, B. J.. 1980. Health hazard evaluation report no. HEE 80-71-703, Bear creek uranium company, Douglas, Wyoming.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970577

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cleaners and Degreasers
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	7-6500 mg/m3
Number of Samples:	7
Number of Sites:	1
Worker Activity:	uranium mine electrician, lab technician, crane maintenance
Type of Sampling:	PBZ and area
Exposure Duration:	2-6 hours
Analytic Method:	NIOSH Method P&CAM 127

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Degreasing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1980)
	Metric 5:	Sample Size	Low	× 1	3	distribution not characterized by statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Gunter, B. J.. 1980. Health hazard evaluation report no. HEE 80-71-703, Bear creek uranium company, Douglas, Wyoming.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970577

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Messite, J.. 1980. Health hazard evaluation report no. HHE 80-110-724, Fairchild industrial products, Commack, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970578

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cleaners and Degreasers
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	2.8-93.1 mg/m3
Number of Sites:	1
Worker Activity:	soldering
Type of Sampling:	PBZ and area
Analytic Method:	NIOSH standard gas chromatography method

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Use of PCE not described
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1980)
	Metric 5:	Sample Size	Low	× 1	3	distribution not characterized by statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides measurement and sample types, but does not provide total samples, exposure frequency, or worker exposure duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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Source Citation:	Messite, J.. 1980. Health hazard evaluation report no. HHE 80-110-724, Fairchild industrial products, Commack, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970578

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kinnes, G. M.. 1993. Health hazard evaluation report no. HETA 89-162-2331, Growth International, Bennett Industries Division, Peotone, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970579

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Inks
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.08 - 0.1 ppm
Number of Samples:	4
Number of Sites:	1
Worker Activity:	silkscreening of plastic containers
Type of Sampling:	PBZ and area
Analytic Method:	NIOSH Methods 1003 and 1550

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Ink
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1993)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide exposure duration or specific sample locations
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Kinnes, G. M.. 1993. Health hazard evaluation report no. HETA 89-162-2331, Growth International, Bennett Industries Division, Peotone, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970579

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ahrenholz, S. H.. 1980. Health hazard evaluation report no. HHE 80-18-691, Looart Press Incorporate, Colorado Springs,Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970580

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Inks
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	ND-0.6
Number of Samples:	2
Type of Measurement or Method:	TWA
Worker Activity:	newspaper pressroom
Number of Workers:	32
Type of Sampling:	PBZ and area
Exposure Duration:	392-512 min
Analytic Method:	NIOSH Method P&CAM 127

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Ink
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1980)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Ahrenholz, S. H.. 1980. Health hazard evaluation report no. HHE 80-18-691, Looart Press Incorporate, Colorado Springs,Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970580

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Esswein, E. J.. 1992. Health hazard evaluation report no. HETA 91-351-2252, Social Security Administration, District Office, Colorado Springs, Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970581

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Office Co-located with Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.18 - 0.30 mg/m3
Number of Samples:	7
Worker Activity:	office building near dry cleaner
Type of Sampling:	PBZ and area
Exposure Duration:	5 hr

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Textile processing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1992)
	Metric 5:	Sample Size	Medium	× 1	2	Data missing figures mentioned in text, uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, but does not provide worker activity or specific sample locations
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Esswein, E. J.. 1992. Health hazard evaluation report no. HETA 91-351-2252, Social Security Administration, District Office, Colorado Springs, Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970581

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Rosensteel, R. E.,Lucas, J. B.. 1975. Health hazard evaluation report no. HHE 74-28-212, Westinghouse Air Brake Company, Wilmerding, Pennsyvlania.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970582

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreaser
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	10-670 mg/m3
Number of Samples:	5
Worker Activity:	degreaser operator, cadmium plater operator, spray painter, painter, rusthon application operator
Type of Sampling:	personal
Exposure Duration:	334, 274, 247, 236, 260 min

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Degreasing, painting
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1975)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Rosensteel, R. E.,Lucas, J. B.. 1975. Health hazard evaluation report no. HHE 74-28-212, Westinghouse Air Brake Company, Wilmerding, Pennsyvlania.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970582

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1983. Health hazard evaluation report no. HETA 82-127-1370, Hoover Company, IP, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970584

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	4.39-50.0 mg/m3
Number of Samples:	9
Type of Measurement or Method:	blood, TWA, urine
Worker Activity:	paint stripper, spray painter, paint mixer, racker, group leader
Type of Sampling:	PBZ and area
Exposure Duration:	5 - 7 hours
Analytic Method:	GC-MS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Paint and coating products
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1983)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1983. Health hazard evaluation report no. HETA 82-127-1370, Hoover Company, IP, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970584

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hanley, K. W.. 1993. Health hazard evaluation report no. HETA 91-004-2316, Daubert Coated Products, Inc., Dixon, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970586

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Paint and coating products
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.3 - 6.1 ppm
Number of Samples:	24
Number of Sites:	1
Type of Measurement or Method:	TWA, short term
Worker Activity:	coating operators
Type of Sampling:	PBZ and area
Exposure Duration:	93-385 min.
Analytic Method:	GC-MS and GC-FID and NIOSH 0500

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Paint and coating products
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1993)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Hanley, K. W.. 1993. Health hazard evaluation report no. HETA 91-004-2316, Daubert Coated Products, Inc., Dixon, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970586

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1984. Health hazard evaluation report no. HETA 82-280-1407, Hoover Company, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970587

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cleaning and Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	40.9-250.0 mg/m3
Number of Samples:	4 (1 personal, 3 area)
Number of Sites:	1
Type of Measurement or Method:	TWA, urine
Worker Activity:	Degreasing, glue lines, Motor Assembly
Type of Sampling:	PBZ and area
Analytic Method:	GC-MS NIOSH S-33514

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Cleaning and Degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1983)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1984. Health hazard evaluation report no. HETA 82-280-1407, Hoover Company, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970587

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Seitz, T.,Baron, S.. 1990. Health hazard evaluation report no. HETA 87-349-2022, Rockcastle Manufacturing, Mount Vernon, Kentucky.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970588

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	textile processing (cut-and-sew)
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Number of Samples:	8
Type of Measurement or Method:	TWA
Worker Activity:	glue sprayer, fabric oven operator, fabric pressser
Type of Sampling:	PBZ and area
Sampling Location:	area: glue room, oven area personal: glue room, oven area, press area
Analytic Method:	GC-MSD

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Textile Processing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1990)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			High		1.6	

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Source Citation:	Seitz, T.,Baron, S.. 1990. Health hazard evaluation report no. HETA 87-349-2022, Rockcastle Manufacturing, Mount Vernon, Kentucky.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970588

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Sussell, A. L.,Lushniak, B. D.. 1990. Health hazard evaluation report no. HETA 90-172-2076, Bussman/Cooper Industries, MPH, Elizabethtown, Kentucky.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970589

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Plastic and rubber products
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1990)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Esswein, E. J.. 2003. Health hazard evaluation report no. HETA 2002-0306-2911, Warren Tech, Lakewood, CO.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970590

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Inks and ink removal products
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Inks and ink removal products
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2003)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Garetano, G.,Gochfeld, M.. 2000. Factors influencing tetrachloroethylene concentrations in residences above dry-cleaning establishments. Archives of Environmental Health.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	630549

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Exposure Concentration (Unit):	9 facility measurements collected with colorimetric detector tubes 14-54 mg/cubic meter (Table 2 on page 6 of 10). Machine attributes (e.g., emission controls, age) are included.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	NIOSH Method 1003
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	New Jersey (Hudson Regional Health Commission)
	Metric 3:	Applicability	High	× 2	2	use data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2000).
	Metric 5:	Sample Size	Medium	× 1	2	distribution of samples adaquately characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Detailed analysis of residences characteristics and monitoring results
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion of the variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor/cold degreasing
Exposure Concentration (Unit):	estimated esposure between 165 - 1150 mg/8-hour workday (pg 19 of 152).++++++++++++++++++++Three of seven men occupationally exposed to PCE concentrations of 1890 mg/m3 to 2600 mg/m3 had evidence of impaired liver function (pg 113 of 152).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning - Commercial plant
Exposure Concentration (Unit):	225-970 mg/day
Number of Samples:	0
Worker Activity:	see table 26 for additional details (pg 127 of 152)++++++++++"Commercial drycleaners" are those engaged primarily in drycleaning or dyeing of apparel and household fabrics other than rugs. This segment of the industry is characterized by a large number of independent businessmen, each of whom operates his own small plant (pg 147 of 152). The following operations and exposures were described: (1) Garment Marking, (2) Spotting, (3) Washing, (4) Transfer, and (5) Finishing (pg 148 of 152).
Number of Workers:	4
Type of Sampling:	Model

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data from greater than 20 years (1982) and dry cleaning machine not specified
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning - Industrial Plant
Exposure Concentration (Unit):	160-970 mg/day
Number of Samples:	0
Worker Activity:	see table 26 for additional details (pg 127 of 152)++++++++++"Industrial drycleaners" are those engaged in supplying laundered or drycleaned work uniforms, wiping towels, dust control items, etc., to industrial and commercial users...Industrial drycleaners employ approximately 25,000 workers, with an estimated 2,000 employees directly exposed to solvent as either cleaning machine operators or maintenance personnel (pg 147 of 152).The following operations and exposures were described: (1) Garment Marking, (2) Spotting, (3) Washing, (4) Transfer, and (5) Finishing (pg 148 of 152).
Number of Workers:	46
Type of Sampling:	Model

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data from greater than 20 years (1982) and dry cleaning machine not specified
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	metal degreasing - vapor
Exposure Concentration (Unit):	650-1150 mg/day
Number of Samples:	0
Worker Activity:	see table 26 for additional details (pg 127 of 152)
Number of Workers:	5+++++trichloroethylene: 8,400tetrachloroethylene: 23,169methyl chloroform: 32,174
Type of Sampling:	Model++++Survey

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	metal degreasing - cold
Exposure Concentration (Unit):	650 mg/day
Number of Samples:	0
Worker Activity:	see table 26 for additional details (pg 127 of 152)++++++++++Cold cleaning (solvent degreasing) involves the use of liquid solvent to remove soil, with solvent being directly hand-applied (rubbing or wiping) in some cases, while spraying or soaking is utilized in other cases.
Number of Workers:	2
Type of Sampling:	Model

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chemical, Co. 2008. Product safety assessment: Perchloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3797950

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use/Manufacture
Physical Form:	Because it has low solubility in water and is highly volatile, perchloroethylene will quickly volatilize (evaporate) to the atmosphere.
Route of Exposure:	breathing air with fugitive PCE from manufacturing or dry cleaning or use in a limited number of consumer products (e.g., aerosol brake cleaners).
Worker Activity:	Those working with PCE as a chemical intermediate in manufacturing operations or catalyst regeneration could be exposed during maintenance, sampling, testing, or other procedures. Exposure is most likely to occur, however, when perchloroethylene is used in surface preparation /cleaning and in dry cleaning applications.
Engineering Control & percent Exposure Reduction:	use closed systems to minimize emissions & exposurehave a thorough training program for employees & safety equipment

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The Dow Chemical Company
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Global
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - this metric is not applicable because this source does not have qualitative data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources described but not fully transparent for this data element.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.

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Source Citation:	Dow Chemical, Co. 2008. Product safety assessment: Perchloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3797950

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Newmoa,. 2001. Pollution prevention technology profile - Closed loop vapor degreasing.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3044986

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Engineering Control & percent Exposure Reduction:	dedicated exhaust system unnecessary with use of closed-loop system
PPE:	PPE unnecessary with closed-loop systems

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Northwest Waste Mgmt Official Association
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2001
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources named, but accuracy unknown
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gold, L. S.,De Roos, A. J.,Waters, M.,Stewart, P.. 2008. Systematic literature review of uses and levels of occupational exposure to tetrachloroethylene. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631587

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Drycleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	42-70 ppm
Worker Activity:	dry-to-dry Operator (1990-2002)
Type of Sampling:	personal
Exposure Frequency:	1-6, Any

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Literature review
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Drycleaning is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1920s-early 2000s
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of variability
Overall Quality Determination†			High		1.3	

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Source Citation:	Gold, L. S.,De Roos, A. J.,Waters, M.,Stewart, P.. 2008. Systematic literature review of uses and levels of occupational exposure to tetrachloroethylene. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631587

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gold, L. S.,De Roos, A. J.,Waters, M.,Stewart, P.. 2008. Systematic literature review of uses and levels of occupational exposure to tetrachloroethylene. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631587

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing (additional, less common uses discussed also)
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	3-45 ppm
Worker Activity:	All types of degreasing, any job title (2000s)
Type of Sampling:	personal and area
Exposure Frequency:	Any

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Literature review
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Drycleaning is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1920s-early 2000s
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of variability
Overall Quality Determination†			High		1.3	

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Source Citation:	Gold, L. S.,De Roos, A. J.,Waters, M.,Stewart, P.. 2008. Systematic literature review of uses and levels of occupational exposure to tetrachloroethylene. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	631587

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	Inhalation of fugitive emissions
Worker Activity:	Dry cleaning machines can be classified into two types: transfer and dry-to-dry...The transfer of wet fabrics is the predominant source of PCE emissions in these systems. Dry-to-dry machines wash, extract, and dry the articles in the same drum in a single machine, so the articles enter and exit the machine dry. Because the transfer step is eliminated, dry-to-dry machines have much lower emissions than transfer machines.Machines are designed to be either vented or non-vented during the drying cycle. In vented machines, the majority of emissions from the drying cycle are vented outside the building. In non-vented machines, dryer emissions are released when the door is opened to remove garments. Currently, the largest sources of emissions from dry cleaning are from equipment leaks, which come from leaking valves and seals, and the loading and unloading of garments.
Number of Workers:	Most of these small firms have fewer than five employees. In fact, over half of dry cleaners in California employ two or less full-time employees.+++++++Table 2. Characteristics of Dry cleaning Ultimate Parent Companies in SIC 7216 [includes number of employees] page 9 of 19
Engineering Control & percent Exposure Reduction:	Enhanced LDAR requires the use of a hand-held halogenated hydrocarbon detector (HHD) for the leak detection of all specified components of a dry cleaner.RC - refrigerated condenser; CA - carbon adsorber

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 3:	Applicability	Medium	× 2	4	employee counts, general exposure and emission control information
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2006)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ma, Turi. 2017. Massachusetts chemical fact sheet: Perchloroethylene (PCE).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986888

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer useIndustrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solventIn-line vapor degreaser (e.g., conveyorized, web cleaner)
Route of Exposure:	Inhalation and dermal exposure
Exposure Concentration (Unit):	Acute (Short-Term) Health Effects:*" Central nervous system effects psychophysiological functions such as mood and behavioral changes have been observed at exposures below 20 parts per million (ppm).* At exposures of 100 ppm PCE can irritate the eyes, nose, mouth, and throat.* High level exposure can cause a headache, dizziness, light-headedness, vomiting, nausea, unconsciousness, and kidney dysfunction* PCE is immediately dangerous to life and health at 150 ppm.
Engineering Control & percent Exposure Reduction:	Use PCE in closed systems. If a closed production system is infeasible, facilities need to enclose operations and use local exhaust ventilation.++++++++++One example of replacement of a PCE vapor degreaser is a Massachusetts metal screw machine products manufacturer that is implementing an aqueous ultrasonic cleaning system for removing various cutting fluids and metal fines.++++++++++Petroleum solvents can also be used as alternatives to PCE for garment cleaning. These solvents are not drop-in replacements however, requiring equipment and safety modifications due to their flammability.
PPE:	Where the potential for exposures exceed 25 ppm use a MSHA/NIOSH and Health-approved supplied air respirator with a full facepiece.Take precautions to avoid PCE contact with skin and eyes. Workers need to wear solvent-resistant gloves and clothing. If PCE contacts skin, immediately wash the exposed area.

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	The Toxics Use Reduction Institue" established by the Massachusetts ToxicUse Reduction Act of 1989
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US

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Source Citation:	Ma, Turi. 2017. Massachusetts chemical fact sheet: Perchloroethylene (PCE).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986888

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 3:	Applicability	Medium	× 2	4	For an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1996)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	states all data sources
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Engineering Control & percent Exposure Reduction:	Two new systems are now available for the dry cleaning industry. The first system includes a detergent that enhances the dissolution ability of liquid CO2 and the second system replaces dry cleaning with wet cleaning, a technology which supplements a standard water solvent with fiber protective additives.
PPE:	Collection of preventing pollution ideas (e.g., use non-toxic solvent, investigate wet cleaning systems) pages 37, 43, 60 of 86

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	New Mexico Environment Departemnt
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated (e.g., NESHAP, RCRA)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Macca, I.,Carrieri, M.,Scapellato, M. L.,Scopa, P.,Trevisan, A.,Bartolucci, G. B.. 2012. Biological monitoring of exposure to perchloroethylene in dry cleaning workers. La Medicina del Lavoro.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1850988

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	air
Exposure Concentration (Unit):	mean concentration of PCE in air was 52.32 mg/m3Table 1 - Values of PCE exposure in 71 subjects occupationally exposed in dry cleaning shopsTable 4 - Peaks of pollution of PCE (in ppm) in some work phases
Number of Sites:	40
Worker Activity:	The average amount of solvent used per year was 117.22 kg (range 25-720 kg). Prevalently (72.1 percent) the dry cleaning machines used a closed cycle and 39 out of 40 shops had one machine, whereas the largest shop had seven machines. Manual stain removal was performed using PCE (1-2 drops) before cleaning; this operation was carried out in the same room where the machine was located. The number of manual stain removal operations was limited to 3-4 times per week in relation to the condition of the clothes.
Number of Workers:	7129 men and 42 women; the mean age of the workers and the mean duration of exposure to PCE were 41.3 and 15.6 years, respectively.
Type of Sampling:	personal diffusive samplers (Radiello")
Exposure Duration:	The employers worked usually 8-9 hours per day, 5-6 days per week; the dry cleaning machines operated only three days per week with an average of 3.64 cycles per day.
Exposure Frequency:	The employers worked usually 8-9 hours per day, 5-6 days per week; the dry cleaning machines operated only three days per week with an average of 3.64 cycles per day.
Engineering Control & percent Exposure Reduction:	The shops involved in our study were above all small cleaners/laundries" none of them had ventilation systems with specific local aspiration equipment.
Analytic Method:	Individual exposure to PCE was assessed in all employees with the Radiello" diffusive sampler (5) for the whole working day... The limit of detection (LOD) was 2 ug/l.++++++++++Instantaneous measurements were also carried out, with direct reading colorimetric gas tube (Kitagawa gas detector tube system) during the most critical work phases, aimed at recording peaks of PCE pollution.

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Source Citation:	Macca, I.,Carrieri, M.,Scapellato, M. L.,Scopa, P.,Trevisan, A.,Bartolucci, G. B.. 2012. Biological monitoring of exposure to perchloroethylene in dry cleaning workers. La Medicina del Lavoro.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1850988

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Information indicates the methodology is acceptable
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	shops in Padua and province (Italy)
	Metric 3: Applicability	High	× 2	2	occupational scenario within the scope of the risk evaluation
	Metric 4: Temporal Representativeness	Medium	× 2	4	This study was carried out in early 2007.
	Metric 5: Sample Size	High	× 1	1	distribution of samples is fully characterized
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Monitoring data include all associated metadata,
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	The monitoring study addresses variability
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2015. ATSDR (Tetrachloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982148

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	6.23 +/- 6.66 ppm (range of 0.38 - 31.19 ppm)
Number of Samples:	35
Number of Sites:	12
Type of Measurement or Method:	TWA
Worker Activity:	dry cleaning, ironing
Number of Workers:	35
Type of Sampling:	personal passive sample
Exposure Duration:	1 work day

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ATSDR report
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Italy
	Metric 3:	Applicability	High	× 2	2	dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Though the paper is current (2015), data from greater than 20 years ago (1994)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Provides measurement and sample types, worker activity, measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	discussion of variability or uncertainty

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Source Citation:	Hsia,. 2015. ATSDR (Tetrachloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982148

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. The safe handling of perchloroethylene drycleaning solvent - Beyond regulatory compliance.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982147

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/skin contact
PPE:	emergency ventilation, available respiratory equipment with NIOSH/Mine Safety approval for organic vapors, protective clothing and gloves.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry Group (HSIA)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Limited applicability. Use guidelines without relevant data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1999
	Metric 5:	Sample Size	N/A		N/A	Not an appropriate metric for type of data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides suggested exposure levels
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Low		2.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part B: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3986481

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	The PCE exposure in shops included in the study was evaluated independently (Ludwig et al., 1983). The geometric mean of time-weighted-average exposures was 22 ppm PCEE for machine operators, and approximately 3 ppm for other workers.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1991 - Monitoring data are from after the establishment of the PEL, but greater than 10 years old.
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by mean, with no other statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Lacks most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982331

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Occupational exposure has trended lower over the past several decades. Typical tetrachloroethylene concentrations in workplace air at drycleaning facilities were 350 to 700 mg/m3 (about 50 to 100 ppm) in the 1970s and 70 to 350 mg/m3 (about 10 to 50 ppm) in the 1980s (IARC 1995). The highest exposures occur during loading and unloading of the drycleaning machines.++++++++++More recent studies by the National Institute for Occupational Safety and Health indicated that exposure levels in the drycleaning industry were below the recommended occupational exposure guideline of 25 ppm (ATSDR 1997). In 2003, the mean concentration of tetrachloroethylene at U.S. drycleaning facilities was 3.8 ppm (Toraason et al. 2003).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US National Toxicology Program, Department of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US and worldwide
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2003)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.

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Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982331

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer useProcessing
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent; Metal (e.g., stainless steel) and stone polishes; Cleaners and degreasers (other)Intermediate in industrial gas manufacturing
Number of Sites:	49,025 (in a survey conducted from 1981 to 1983)
Number of Workers:	688,000 (in a survey conducted from 1981 to 1983)Workers involved in drycleaning, metal degreasing, and fluorocarbon production are likely to be exposed to tetrachloroethylene. The National Occupational Exposure Survey (conducted from 1981 to 1983) estimated that 688,000 workers in 49,025 U.S. facilities potentially were exposed to tetrachloroethylene (NIOSH 1990). A 1994 survey prepared by industry estimated that 450,000 workers potentially were exposed (IARC 1995).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US National Toxicology Program, Department of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US and worldwide
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (survey conducted from 1981 to 1983)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.

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Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	In one case where a dry cleaning worker was found unconscious, breath concentrations of tetrachloroethylene were over 4,000 mg/m3 a few hours after exposure.+++++++++++++++ In the subsequent behavioural study, the dry-cleaners were categorised into low (24 counter clerks), moderate (18 pressers) and high (23 operators) cumulative exposure groups. The mean 15-minute personal breathing zone tetrachloroethylene concentrations for these groups were respectively 11.2, 23.2 and 40.8 ppm (77.3, 160 and 282 mg/m3) for the 17 dry-cleaning shops using the wet transfer process. The mean periods in the current job for the 3 groups were respectively 2.1, 3.9 and 14.6 years. Echeverria et al (1995)
Number of Sites:	23There are a number of deficiencies associated with this study, including a low participation rate (only 23 out of the 125 dry-cleaning shops approached), failure in taking into account prior neurotoxicant exposures and the lack of an unexposed control group.
Worker Activity:	counter clerks, pressers and operators
Number of Workers:	65

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1995)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	An Italian study examined the neurobehavioural effects of occupational exposure to tetrachloroethylene in 60 female dry-cleaning workers (with an average of 10 years service) by comparing them with 30 age-, vocabulary test score- and sex-matched controls recruited from an industrial cleaning plant where solvents were not in use (Ferroni et al, 1992). Selection criteria included: (i) absence of metabolic diseases; (ii) absence of neuropsychiatric disorders; (iii) alcohol intake of less than 80 ml ethanol a day. Tetrachloroethylene airborne concentration measured through static sampling during four-hour random periods varied from 1 to 67 ppm, 6.9 to 462 mg/m3 (median 15 ppm, 104 mg/m3). Ferroni et al (1992)
Number of Workers:	90

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1992)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	A German study evaluated 101 employees of dry-cleaning shops, including ironers and touch-up workers as well as actual cleaners, all of whom were employed for "several years" and a control group of 84 sales staff from department stores and hotel receptionists (Seeber, 1989). Of the 101 dry-cleaning shop employees, 57 were assigned to a low tetrachloroethylene exposure group (shift TWA = 12 ppm, 83 mg/m3) and 44 to a high exposure group (shift TWA = 54 ppm, 373 mg/m3). Tetrachlororethylene exposure was determined by room air sampling and individual passive sampling using badge dosimetry.
Number of Workers:	101

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1989)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	An earlier American study looked at 9 male and 9 female dry-cleaners (mean 8-hour TWA for tetrachloroethylene of 18 and 32 ppm (124 and 221 mg/m3) in females and males respectively, range = 1-37 ppm (6.9 255 mg/m3), peak = 215 ppm (1484 mg/m3) determined by analysing breath samples and through static sampling), and compared them with 9 female laundry workers as controls (Tuttle et al, 1977).
Worker Activity:	Comparison of 18 dry cleaners with 9 laundry workers.
Number of Workers:	27

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	N/A		N/A	Data over 20 years old (1977)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

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Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Automotive care products (e.g., engine degreaser and brake cleaner)
Exposure Concentration (Unit):	Some measured concentrations >2800 mg/m3 (400 ppm) but 75 percent of measurements between 1.4-344 mg/m3 (0.2 and 50 ppm)Essing et al (1975)
Worker Activity:	106 workers exposed while cleaning machine and engine parts in railway repair shop, 101 controls
Number of Workers:	106

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1975)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	138 mg/m3 (20 ppm; 8 hour TWA)
Worker Activity:	56 dry cleaning workers; Cai et al (1991)
Number of Workers:	56

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	61.4-259 mg/m3 (8.9-37.5 ppm)
Worker Activity:	Comparison of 26 dry cleaning workers with 33 unexposed workers; Lauwerys et al (1983)
Number of Workers:	59

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1983)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	8 hour TWA < 345 mg/m3 (50 ppm)
Number of Sites:	47
Worker Activity:	Comparison of 141 workers from 47 small laundries and dry cleaning shops, controls of 130 university staff and students; Gennari et al (1992)
Number of Workers:	141

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1992)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Estimated as 68.9 mg/m3 (10 ppm)
Worker Activity:	57 dry cleaning workers, 80 controls; Franchini et al (1983)
Number of Workers:	57

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 20 years old (1983)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 1989. 1988 OSHA Pel Project documentation: Perchlorethyle.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986443

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	A worker exposed to an estimated concentration of 1470 ppm perchloroethylene and Stoddard solvent for 3.5 hours lost consciousness (Stewart, Erley, Schaffer, and Gay 1961/Ex. 1-807)
Number of Workers:	"...several hundred thousand employees are regularly exposed to this widely used solvent."
Engineering Control & percent Exposure Reduction:	In the dry cleaning industry, newer equipment, such as dry-to-dry dry cleaning machines, can achieve 25 ppm with engineering and work practice controls. This is true of smaller as well as larger operations" According to the industry, dry cleaning equipment is replaced at approximately 10-year intervals.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (survey conducted from 1961)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Osha,. 1989. 1988 OSHA Pel Project documentation: Perchlorethyle.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986443

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2007. Occupational health hazard risk assessment project for California: Identification of chemicals of concern, possible risk assessment methods, and examples of health protective occupational air concentrations.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982225

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	All PBZ data is regulatory (e.g., Cal/OSHA PEL); also includes calculationed air concentrations associated with a specified level of cancer risk.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	report for setting OEL, no applicable data for exposure assessment
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2002)
	Metric 5:	Sample Size	N/A		N/A	NA - qualitative information only
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	PCE is readily absorbed through the lungs and gastrointestinal tract and, to a lesser extent, can be absorbed through the skin.
Exposure Concentration (Unit):	TWA exposures of machine operators ranged from 4.0 to 149.0 ppm PCE (geometric mean = 22 ppm). The geometric mean PCE exposure of the pressers, seamstresses, and front counter workers were 3.3 ppm, 3.0 ppm and 3.1 ppm, respectively. The geometric mean 5-minute peak PCE exposure during textile transfer was 44 ppm while the mean 15-minute exposure was 33 ppm.
Number of Sites:	44
Worker Activity:	Among the various jobs in a dry cleaning facility, Ludwig et al. (1983) found that the machine operators (dry cleaners) had the greatest PCE exposure.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (reference study was published in 1983); exposure data prior to ban and machine type not specified
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by range and mean, with no other statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Lacks most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	In a study of 60 female dry-cleaning workers with an average employment duration of 10.1 years, Ferroni and colleagues found statistically significantly longer simple reaction times and longer reaction time in tests of shape comparison (Ferroni et al., 1992). Exposure was determined by 4-hour air samples taken in each workplace at two different times of year (median 15 ppm), and by blood concentration of PCE (median 145 mg/L).
Number of Workers:	60
Exposure Duration:	10.1 years

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Sampling or analytical methodology is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (reference study was published in 1983); exposure data prior to ban and machine type not specified; however, potentially other useful information.
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by median, with no other statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Lacks most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		Medium		2.2	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Color vision was tested in a group of dry-cleaning workers, using a desaturated color test and a sensitive measurement scale (Cavalleri et al., 1994). Subjects were selected from workers with low alcohol intake. Exposure assessed by personal sampling for a full shift. A statistically significant increase in color confusion was observed in exposed subjects, mostly affecting blue-yellow discernment. When the data for ironers with lower exposure (4.8 ppm, range 0.5-11.3) were analyzed separately from data for dry-cleaners (7.3 ppm, range 0.4-31.2), the drycleaning workers were found to have a significant increase in dyschromatopsia that was not observed in ironers. The same group of workers was followed up two years later (Gobba et al., 1998).
Worker Activity:	ironers and dry-cleaners

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (reference study was published in 1983); exposure data prior to ban and machine type not specified; however, potentially other useful information.
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Worker Activity:	Properly trained professional cleaners are now able to successfully wetclean most garments that are typically drycleaned. Silks, wool sweaters, linens, suedes and leathers can usually be wetcleaned, sometimes with superior results.
Engineering Control & percent Exposure Reduction:	There are many factors that influence perc air levels in drycleaning shops and each shop is unique. Perc evaporates quickly and can enter the air of drycleaning shops in many ways: 1) From poorly maintained machines; 2) Through equipment leaks; 3) From perc that is open to the air, such as when liquid solvent is being added to the machines or when there are open drums and tanks containing perc or perc waste materials; 4) From clothes that are not completely dry or improperly processed; and 5) From clothes being transferred from a washer to a dryer in older "transfer" machines that have separate washers and dryers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA Office of Pollution Prevention and Toxics
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1998)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982095

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Over the years, exposures to PERC have been evaluated while employees performed various tasks with various types of dry cleaning equipment. Exposures have been reduced through the technology advancements in the dry cleaning industry, as shown below:e.g., Gen 1 transfer:Peak Concentration = 1,000 4,000 ppmTime Weighted Average = 40 60 ppm++++++++++The TWA exposures to PERC for spotters and pressers were found to be lower than the exposures of dry cleaning machine operators.
Engineering Control & percent Exposure Reduction:	Adequate ventilation and proper design of ventilation is most effective in controlling employee exposure to PERC when used as one part of an overall control plan. It is suggested that there be a complete air change every 5 minutes with a minimum of 30 cubic feet per minute of outside air per person. Sufficient make-up air must be provided for optimum exhaust performance. Dry cleaning machines with integral exhaust systems should have a door face air velocity of 100 feet per minute. Older machines can be retrofitted with exhaust hoods.Maintenance of the dry cleaning equipment and storage of chemicals can also affect personal exposures. Checking seals, gaskets, piping, ductwork and evaluating the vapor recovery system are essential in controlling leaks and fugitive emissions. Equipment should be maintained in accordance with the manufacturer"s recommendations.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	North Carolina Department of Environment and Natural Resources - Division of Pollution Prevention and Environmental Assistance
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US
Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.

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Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982095

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1992. Health hazard evaluation report no. HETA-90-223-2211, Thomson Consumer Electronics, Marion, Indiana.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974943

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cleaning and Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.3 - 2 ppm pbz0.2 - 50 ppm area
Number of Samples:	3 field blanks, 11 charcoal tube samples.
Worker Activity:	degreasing
Number of Workers:	1900
Type of Sampling:	PBZ and area
Sampling Location:	4 personal at degreaser#4 (2 each loading & unloading)2 area at degreaser #41 area at each degreaser #1, #2 and #3
Analytic Method:	NIOSH analytical methods 1003, 1300, 1400, 1450, 1500, 1501

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for TCE not PCE
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1990)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty

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Source Citation:	Niosh,. 1992. Health hazard evaluation report no. HETA-90-223-2211, Thomson Consumer Electronics, Marion, Indiana.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974943

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burr, G. A.. 1996. Health hazard evaluation report no. HETA 96-0188-2605, Greater Wheaton Chamber of Commerce, Wheaton, Illinois.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970591

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Report looks at potential exposure to solvents from an adjacent building, not applicable use.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1990)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ceballos, D.,Roberts, J.,Whitaker, S.,Lee, E. G.,Gong, W.. 2015. Health hazard evaluation report no. HEE2012-0084-3227, Evaluation of occupational exposures at drycleaning shops using solvonK4 and DF-2000.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970592

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation, dermal
Exposure Concentration (Unit):	No PCE exposure data (study on alternative solvent exposures)
Number of Samples:	13 personal air samples, 35 area air samples
Number of Sites:	2
Worker Activity:	loading, unloading and pressing
Number of Workers:	4
Type of Sampling:	dermal patch, pbz, area aiar
Sampling Location:	Near drycleaning machines
PPE:	leather gloves
Analytic Method:	modified NIOSH 1550

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	dry cleaning using different solvent (not Perc), other info may be useful
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, measurement duration

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Source Citation:	Ceballos, D.,Roberts, J.,Whitaker, S.,Lee, E. G.,Gong, W.. 2015. Health hazard evaluation report no. HEE2012-0084-3227, Evaluation of occupational exposures at drycleaning shops using solvonK4 and DF-2000.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970592

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burton, N. C.,Monesterskey, J.. 1996. Health hazard evaluation report no. HETA 96-0135-2612, Eagle Knitting Mills, Inc., Shawano, Wisconsin.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970594

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Spot Cleaner
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Range 0.03-1.03 ppm at spotter station
Number of Sites:	5
Worker Activity:	spot cleaning completed garments
Number of Workers:	10 (at station using perc)
Type of Sampling:	pbz, area
Sampling Location:	sewer, spotter, repair station, spotter station, cutting table
Exposure Duration:	varies
PPE:	face masks (non organic filtering)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	spot cleaning using perc, but process is not the same as dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1996
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, measurement duration
Domain 4: Variability and Uncertainty						

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Source Citation:	Burton, N. C.,Monesterskey, J.. 1996. Health hazard evaluation report no. HETA 96-0135-2612, Eagle Knitting Mills, Inc., Shawano, Wisconsin.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970594

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Doiano, J. M.. 1980. Health hazard evaluation report no. HHE 80-74-714, Standard Publishing Company, Cincinnati, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970600

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	printing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	lithographic process
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1980
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruhe, R. L.. 1982. Health hazard evaluation report no. HETA 82-040-119, Synthes Ltd. (USA), Monument, Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970595

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvent and/or degreasers
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	9 - 24 mg/m3 (pbz)50 mg/m3 (area)
Number of Samples:	3 pbz, 9 area
Number of Sites:	8
Worker Activity:	degreasing tank
Number of Workers:	100 total, 46 in production
Type of Sampling:	pbz, area
Exposure Duration:	8 hour TWA
Analytic Method:	NIOSH S-335

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	electro-polishing of surgical implants
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1981-1982
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, measurement duration
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty

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Source Citation:	Ruhe, R. L.. 1982. Health hazard evaluation report no. HETA 82-040-119, Synthes Ltd. (USA), Monument, Colorado.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970595

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Route of Exposure:	inhalation
Exposure Concentration (Unit):	In the RAR a reasonable worst case (RWC) 8-hr TWA of 10 ppm (68 mg/m3) was used in the risk characterisation. This value was derived from the analysis of industry data of 837 samples from a three and half year period from January 1991. A total of 81 percent of exposures were below 1 ppm (7 mg/m3), only 8 results were found to be in excess of 10 ppm (68 mg/m3), with two results being above 100 ppm (680 mg/m3). The typical value of 0.5 ppm (3.4 mg/m3) was based on 298 samples from a packing area within a manufacturing plant.The new data (summarised in Annex I) cover long-term inhalation exposures (8-hr TWAs) from 2002 to 2008. The submitted data (totalling 1484 samples) indicate that exposures are, in general, lower than those given in the RAR. Operators and maintenance staff were found to be exposed to the highest levels of tetrachloroethylene in the workplace (see Annex I, Table A1.9).
Number of Samples:	2321
Worker Activity:	The EU has developed a programme for protection of workers against risks from dangerous substances...SCOEL provides scientific advice to the European Commission to underpin regulatory proposals on exposure limits for chemicals in the workplace.Table 9.1 Current National occupational exposure limits within the EU (page 36 of 80).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Route of Exposure:	dermal
Exposure Concentration (Unit):	No measured data were available to determine dermal exposures; therefore exposures were modelled using EASE. This gave a RWC of 1 mg/cm2/day (intermittent contact and non dispersive use) with an assumed exposed surface area of 210 cm2. A typical (incidental contact and non-dispersive use) dermal exposure value of 0.1 mg/cm2/day with an assumed exposed surface area of 210 cm2 was also derived.
Type of Measurement or Method:	EASE model

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Route of Exposure:	inhalation and dermal
Exposure Concentration (Unit):	See Section B.9.2 Manufacturing and Packaging++++++Also see "Table 10.1 Risk characterisation ratios for inhalation, dermal and combined exposures during manufacture and packaging of tetrachloroethylene"
Worker Activity:	The RAR concluded that tasks carried out during recycling were similar to those during manufacturing. Therefore, the exposure values calculated in the RAR for manufacturing were used as representative of exposures that may be seen in recycling.
Number of Workers:	fewer than ten workers potentially exposed

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	A typical exposure value of 8 ppm (54 mg/m3) and a RWC value of 30 ppm (equivalent to 203 mg/m3) were used in the risk characterisation.+++++++Two large companies who operate many dry cleaning establishments in the UK submitted data. Company 1 submitted data covering 2005 (69 samples covering 34 different dry cleaning establishments), 2006 (52 samples covering 27 sites) and 2008 (5 samples covering 2 sites). Company 2 supplied 673 long-term exposure samples for 2008 covering 244 different dry cleaning establishments. A summary of the monitoring data from both companies can be found in Annex II... The monitoring data from 2008 only (678 samples) has been used to determine the typical and long-term inhalation results (see Table 9.3).+++++++Also see "Table 10.2 Risk characterisation ratios for inhalation, dermal and combined exposures during the use of tetrachloroethylene in dry cleaning"
Type of Measurement or Method:	assumption++++++++++++monitoring data
Engineering Control & percent Exposure Reduction:	Section C identifies possible alternative substances and techniques for drycleaning e.g., Green Earth, Resolv Dry Cleaning System

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	dermal
Exposure Concentration (Unit):	To obtain a typical exposure value again the EASE model (direct handling with intermittent contact) was used. A typical dermal exposure value of 0.5 mg/cm2/ day with an assumed exposed surface area of 840 cm2 was obtained.
Type of Measurement or Method:	EASE model

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Although, there were some measured data for long-term inhalation exposure data available within the RAR the EASE model was used because the measured data were from totally enclosed machines. The results from the industry data, which were from 52 samples, showed 8-hr TWAs of 3.9 ppm (equivalent to 26 mg/m3) as a RWC and 0.5 ppm (3.4 mg/m3) as a typical exposure. However, the EASE model was seen as more representative of manual degreasing, using an open bath with lip extraction. The parameters were non-dispersive use with LEV. Typical long-term exposure was assumed to be 10 ppm (equivalent to 68 mg/m3) and the RWC to be 20 ppm (equivalent to 138 mg/m3).++++++++++++++++Also see "Table 10.3 Risk characterisation ratios for inhalation, dermal and combined exposures during the use of tetrachloroethylene in open metal degreasing" and "Table 10.4 Risk characterisation ratios for inhalation, dermal and combined exposures during the use of tetrachloroethylene in enclosed metal degreasing systems"
Worker Activity:	The degreasing process can range from fully automated to manual and there will be a range of working practices depending on the nature of the business that is using degreasing.
Engineering Control & percent Exposure Reduction:	The two most common methods of controlling exposure are enclosure and lip extraction. Operators can be exposed as a result of; incorrect siting of the plant, excessive drag out, due to incorrect operation, inadequate plant maintenance, overloading of equipment and incorrect jigging of work, leading to solvent trapping. Occupational exposure can also occur during the cleaning out of degreasing plants.++++++++++Section C identifies possible alternative substances and techniques for metal degreasing e.g., Laser Cleaning

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Route of Exposure:	dermal
Exposure Concentration (Unit):	To obtain a typical exposure value again the EASE model (direct handling with intermittent contact) was used. A typical dermal exposure value of 0.5 mg/cm2/ day with an assumed exposed surface area of 840 cm2 was obtained.
Type of Measurement or Method:	EASE model

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Catalyst regeneration in petrochemical manufacturing
Route of Exposure:	inhalation
Exposure Concentration (Unit):	See Section B.9.2 Manufacturing and Packaging+++++++++Also see "Table 10.6 RCRs for consumer exposure to back-in-use bulky materials"
Worker Activity:	The dosing volume of tetrachloroethylene required for catalyst regeneration is dependent on the volume throughput of the oil refining facility. Tetrachloroethylene is generally supplied via 216 litre drums or via an intermediate bulk container (IBC). From the transport container the tetrachloroethylene is pumped to a buffer vessel. From there it is dosed to the plant via a closed system. Specialised drums fitted with hose connections for enclosed transfer to the dosing vessel are used in newer installations. In some older systems, filling of the dosing/pre-feed vessel may be via a separate pumped connection, which is then directly fed into the process via a closed system. This is reported to be a simple and quick operation to perform. Maintenance of the facilities is performed according to existing permit to work controls.As the tasks carried out are similar to those performed during manufacturing, the new exposure values for manufacturing outlined in section B.9.2 (Table 9.2) will be used as indicative for this scenario. It is noted that actual frequency and duration of tasks involving exposure to tetrachloroethylene during this operation are expected to be significantly less than for its manufacture, and therefore these exposure values may be considered to be conservative.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	an occupational scenario within the scope of the risk evaluation

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970791

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970844

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Exposure Concentration (Unit):	See Table 1.5 Exposures to tetrachloroethene in industries and occupations other than those associated with dry-cleaning (pg 232 of 525). In total, 29 studies were referenced.
Worker Activity:	Discussion of occupational exposure of "workers in other industries" begins on page 248 of 525.
Number of Workers:	688,000 workers in a wide range of industries (according to the National Occupational Exposure Survey conducted between 1981 and 1993 by US NIOSH)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	World Health Organization
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Date representing the World and USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (pubished in 2014, but many cited studies were older)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

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Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970844

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970844

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	See Table 1.4 Exposures to tetrachloroethene in dry-cleaning shops (page 226 of 525). In total, 41 studies were referenced.
Worker Activity:	Discussion of occupational exposure begins on page 238 of 525.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	World Health Organization
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Date representing the World and USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (pubished in 2014, but many cited studies were older)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1995. In-depth survey report: Control of perchloroethylene exposure in commercial dry cleaners at Appearance Plus Cleaners.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974915

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	The machine operator = 7.8 ppm TWA PERC (nearly half of this exposure resulted from loading and unloading). Presser = less than 1 ppm TWA. Highest area measurements (5.4 and 5.7 ppm) were taken above the door of the dry cleaning machines.
Type of Measurement or Method:	PBZ and area
Worker Activity:	Three workers were sampled: the machine operator, a presser, and a clothing inspector.
Number of Workers:	25
Exposure Duration:	The shop is open for business from 7am to 8pm Monday throgh Saturday and Saturday 8am to 6pm.
Engineering Control & percent Exposure Reduction:	Ventilation consisted of three large, propeller fans located in the rear wall" The air was exhausted outside of the buildingTo reduce exposure, improve vapor recovery or use local exhaust ventilation.
PPE:	Chemical splash goggles and protectie gloves should be used at the spotting stationto reduce dermal exposure to hazardous chemicals. A proper respirator program should also be established.
Analytic Method:	NIOSH Method 103 for halogenated hydrocarbons.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1994)

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Source Citation:	Niosh,. 1995. In-depth survey report: Control of perchloroethylene exposure in commercial dry cleaners at Appearance Plus Cleaners.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974915

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2002. In-depth survey report: Control of perchloroethylene (PCE) in vapor degreasing operations, site #2.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974916

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Exposure Concentration (Unit):	The PCE concentrations measured in the building ranged from 21 to 38 ppm during closed building conditions and ranged from 16.3 ppm to 22.4 ppm during open building conditions. After repairs to the PCE vapor degreaser concentrations were further reduced to a range of 6.6 ppm to 12. 7 ppm following the maintenance operations.
Type of Measurement or Method:	PBZ and area
Worker Activity:	It is a leading manufacturer ofbrazed aluminum heat exchangers and cooling systems, serving off-highway, on-highway, industrial, mining, and other markets. The company specializes in developing custom aluminum cooling systems that satisfy cooling requirements for air, oil, diesel fuel, and water/glycol applications. The cleaning ofparts is necessary to remove dirt and oils from the aluminum parts prior to assembly and furnace brazing.++++++++++This report examines worker exposures to PCE during the loading and unloading ofparts, and the performance of an open-top vapor degreaser equipped with a local exhaust ventilation system at the loading/unloading station. Air samples for PCE were collected on two separate occasions covering five days of degreasing operations.
Exposure Duration:	The degreasing operation at this facility runs two 10-hour shifts". The degreaser operator and assistant operator typically spend about one and one-half to two hours per shift at the loading/unloading station; the remainder oftheir day is spent placing parts onto racks, removing cleaned parts from the cleaning baskets, and transporting cleaned parts to the "clean room." The second shift degreaser operator has the added responsibility of adding PCE to the vapor degreaser unit.
Engineering Control & percent Exposure Reduction:	A smoke machine was used to visualize and characterize air flow patterns near the loading/unloading station of the vapor degreaser. The smoke test revealed some air flow problems" Options for overcoming the operational deficiencies in the general ventilation ofthe core building are discussed below.++++++++++There are 11 recommendations in all e.g., fan belts should be inspected on a weekly basis

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Source Citation:	Niosh,. 2002. In-depth survey report: Control of perchloroethylene (PCE) in vapor degreasing operations, site #2.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974916

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Analytic Method:		For this particular study, the MiniRae 2000 Portable voe Monitor, Model PGM7600, (manufactured by Rae Systems Incorporated) served as the direct-reading instrument.			

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2002).
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		High		1.4	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Moseley, C. L.. 1980. Health hazard evaluation report no. HHE 79-42-685, Motion Picture Screen Cartoonists, Local 841, New York, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970614

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Photographic film
Exposure Concentration (Unit):	It was determined that nine employees were exposed to concentrations of perc (range of 487 to 1606 mg/M3) ... exceeding the NIOSH recommended criteria of 340 mgfM3 (680-15 minute ceiling). Eight of the nine personal overexposures were found in one establishment -Film Opticals.
Number of Sites:	14
Worker Activity:	The request alleged employee exposure to film cleaning fluid (methyl chloroform) and liquid gate fluid (50 percent methyl chloroform/50 percent perchloroethylene) causing dizziness, blurred vision, nausea, sore throat and dermatitis.
Number of Workers:	52
Engineering Control & percent Exposure Reduction:	Information available from the National Cancer Institute has led NIOSH to conclude that perchloroethvlene is a potential human carcinogen. Therefore, exposure to perchloroethylene. which was demonstrated in all 14 optical shops surveyed, should be minimized and preferably eliminated altogether by use of a less hazardous substitute.
PPE:	Recommendation #8 -...Wear neoprene gloves or other suitably impervious gloves. while handling the solvents.
Analytic Method:	In order to evaluate worker exposure to methyl chloroform and PERC, PBZ air samples, long term (4-8 hours) and short term (15-30 minutes), were obtained. In addition, area (process) air samples were taken in selected areas of the individual workshops ... samples were obtained according to standard NIOSH sarrpling and analytical methods

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH

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Source Citation:	Moseley, C. L.. 1980. Health hazard evaluation report no. HHE 79-42-685, Motion Picture Screen Cartoonists, Local 841, New York, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970614

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.With the advent of digital motion pictures, this occupational exposure is greatly reduced.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1980)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burotn, N. C.. 1994. Health hazard evaluation report no. HETA 93-0351-2413, Goodwill Industires of America, Inc. Bethesda, Maryland.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Inks and ink removal products
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Perchloroethylene concentrations (0.61 and 1.66 ppm) were below the Occupational Safety and Health Administration standard of 100 ppm, however, NIOSH recommends that exposures to perchloroethylene be reduced to the lowest feasible concentration.
Number of Sites:	25
Worker Activity:	The print shop had its own HVAC system and a wall exhaust fan that led directly outside. It was equipped with three presses which used rubber-based ink and one press which used oil-based inks... Environmental tobacco smoke (ETS) was identified as a health hazard in this building. ETS and chemicals used in the print shop had the potential to enter the recirculating ventilation system. The ventilation systems turned off when not calling for heating or cooling.
Number of Workers:	70
Exposure Duration:	At the time of the NIOSH site visit, there were approximately 70 employees who occupied the building between 7:30 a.m. and 1:00 a.m.
Engineering Control & percent Exposure Reduction:	To reduce exposures to perchloroethylene and other potentially hazardous substances, the print shop should use the exhaust fan on a low setting whenever the presses are operating. The print shop should be maintained under negative air pressure with respect to surrounding areas to prevent migration of contaminants to other building areas. If use of the exhaust fan at its present location interferes with the two presses, an additional exhaust fan could be installed at a different location in the print shop.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH

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Source Citation:	Burotn, N. C.. 1994. Health hazard evaluation report no. HETA 93-0351-2413, Goodwill Industires of America, Inc. Bethesda, Maryland.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970615

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1994)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, G. E.. 1980. Health hazard evaluation report no. HHE 79-96-729, Protective Coatings Corporation, Fort Wayne, Indiana, Part 2.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970643

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvent-based adhesives and sealants
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Eleven samples for xylene and toluene were taken on men lining or cementing in tanks in the roundhouse or the tank lining area of the main plant. Seven of these eleven were overexposed to one or a combination of these compounds. These overexposures represent both short term and time weighted average exposures. Exposure to MEK, MIBK, trichloroethylene and tetrachloroethylene was not a problem. Two samples were taken for silica inside the sandblasters' hood. Both indicated an overexposure.++++"Table II. Xylene, Toluene, MIBK and Tetrachloroethylene Concentrations" showed that 7 of the 11 samplese were non-detect.
Number of Samples:	11Eleven samples for xylene and toluene were taken on men lining or cementing in tanks in the roundhouse or the tank lining area of the main plant.
Number of Sites:	1
Type of Measurement or Method:	PBZ
Worker Activity:	The purpose of this evaluation was to study possible hazards to employees resulting from occupational exposure to various substances used in the relining of tanks.One building, the roundhouse, is used exclusively for the relining of railroad tank cars with rubber sheeting. The other area, the main plant, is involved in the relining of semi-trailer tanks and tanks of all sizes, the production of expansion joints and making of a variety of belts and special rubber products. Tanks to be relined must have the old lining removed. This is sometimes done by heating the outside of the metal tank with a propane flame to burn away the old lining. Other times the old lining is cut away from the inside of the tank. In either case employees go into the tank to cut up and remove the old lining and then the interior of the tank is blasted with metal shot or silica sand to make a clean, smooth surface. When the tank is prepared for relining, a crew from one to several men, depending on the size of the enclosure, will then enter the tank and apply a new lining.
Number of Workers:	65

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Source Citation:	Burroughs, G. E.. 1980. Health hazard evaluation report no. HHE 79-96-729, Protective Coatings Corporation, Fort Wayne, Indiana, Part 2.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970643

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Engineering Control & percent Exposure Reduction:		Workers, especially those who are being hired into the tank lining department, should receive a preemployment history and physical examination along with a baseline chest x-ray as a minimum. The employer should make an effort to reveal to the workers the type of materials being used in the plant and their known hazards as well as getting as much information as possible on the contents of certain previously used tanks and their contents so that workers may be informed as to the potential hazards with which they work.			

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4: Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1980)
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kramkowski, R. S.. 1978. Health hazard evaluation report no. HHE 78-56-511, Westclox-Division of General Time Corp., Peru, Illinois.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970653

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Cleaners and degreasers (other)Lubricants and greases (e.g., penetrating lubricants, cutting tool coolants, aerosol lubricants)
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Results from the personal breathing zone and area samples collected are shown in Table 1. All samples are well below the evaluation criteria used in this report.++++++++Table 1 "ATMOSPHERIC CONCENTRATIONS OF SOLVENT CONSTITUENTS WESTCLOX-DIVISION OF GENERAL TIME CORPORATION FUSE SUB-ASSEMBLY" shows all 7 tetrachloroethene measurements were below 1 ppm. Three tetrachloroethene measurements taken near the degreaser were all 0.3 ppm.
Number of Sites:	1
Type of Measurement or Method:	PBZ and area
Worker Activity:	The Westclox plant is in the business of producing clocks and timing devices.The plant encompasses about 750,000 sq. ft. of floor space; however, the request area is only a small portion of the total area. The specific area (3rd floor "down" , Depart 627 , Fuse Subassembly) has not had significant changes since 1963 -except following a loss-of-coolant incident on January 20 , 1978. This area processes parts for fuses; operations include milling, drilling , repiercing, deburring and cleaning.++++++++++++The facility also had a degreaser
Number of Workers:	54For the purpose of informing the 54 affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.+++++++++Eleven employees were given nondirected interviews to determine if they had experienced health problems as a result of their work place exposure. Except for employees involved in the "exposure" incident; no symptoms were reported regarding day to day activities; except a sporatic "whiff of something."
Engineering Control & percent Exposure Reduction:	Precautions had already been taken to avoid a reoccurrence of the loss of coolant (mechanical failure) that caused some of the employees to be overcome . These mechanical devices should be routi"nely inspected and properly maintained to assure adequateprotection for the employees.

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Source Citation:	Kramkowski, R. S.. 1978. Health hazard evaluation report no. HHE 78-56-511, Westclox-Division of General Time Corp., Peru, Illinois.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970653

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Analytic Method:		Breathing zone and general area atmospheric samples for trichloroethylene were collected on organic vapor charcoal sampling tubes using portable battery powered sampling pumps operating at approximately 200 cubic centimeters (cc) per minute. Samples were analyzed by gas chromatography. Other identifiable constituents of the solvent (benzene and tetrachloroethylene) are also reported.			

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4: Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1978)
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McCleery, R. E.,Nemhauser, J. B.,Martinez, K. F.. 2002. Health hazard evaluation report no. HETA 200-0124-2875, Tenneco Automotive, Milan, Ohio.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970605

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Plastic and rubber products
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Initial Site Visit - Table 1 indicates the major peaks and their associated collection area. Appendix A gives the peak number and its associated compound as well as the chromatograms for each sample collected" Other compounds present in some samples included perchloroethylene.++++++++++Followup Site Visit - Table 2 indicates the major peaks and their associated collection area. Appendix B gives the peak number and its associated compound as well as the chromatograms for each sample collected. Other compounds present in somesamples included perchloroethylene.
Number of Samples:	16
Number of Sites:	1
Type of Measurement or Method:	area
Worker Activity:	The NIOSH request expressed concern about inadequate ventilation and possible nitrosamine generation from the rubber mixing and curing processes in the facility.The plant consists of 3 lines of natural and synthetic compounding and mixing, 19 injectionmolding presses, 66 transfermolding presses, and two lines of adhesive application. There are approximately 100 different formulations of rubber routinely used. The plant also has 200300 nonroutine, past or present molds that can be used. The finishing operations include swages for a variety of parts, buffers for removing flash from parts, manual cutters and slitters for bar mold parts, hoppers for inspection of parts not meeting quality standards, a liquid nitrogen tumbler to deflash rubber parts, and washer lines to rinse/wash/rinse/dry rubber parts.
Number of Workers:	50The plant currently has 50 salaried employees which include 12 engineers, 8 production supervisors, 3 production control personnel, and 2 skilled trades supervisors.

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Source Citation:	McCleery, R. E.,Nemhauser, J. B.,Martinez, K. F.. 2002. Health hazard evaluation report no. HETA 200-0124-2875, Tenneco Automotive, Milan, Ohio.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970605

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Engineering Control & percent Exposure Reduction:		Not enough supply air was coming into the facility+++++++++The TA facility relies heavily on dilution ventilation for control of contaminants that may be released during the production process. The ventilation survey indicated that the facility is under considerable negative pressure mostly due to ceiling exhaust fans located throughout the building. This considerable negative pressure can reduce the overall efficiency of the system and also result in system stress due to increased static pressures induced on the fans.			
Analytic Method:		Initial Site Visit - Eight thermal tube area air samples were collected.++++++++Followup Site Visit - Eight thermal tube area air samples were collected.			

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4: Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago.Site visits in 2000 and publication in 2002.
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	McCleery, R. E.,Nemhauser, J. B.,Martinez, K. F.. 2002. Health hazard evaluation report no. HETA 200-0124-2875, Tenneco Automotive, Milan, Ohio.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970605

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Marlow, D. A.. 1996. Health hazard evaluation report no. HETA 94-0405-2551, Metropolitan St. Louis Sewer District, Lemay Wastewater Treatment Plant, St. Louis, Missouri.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970610

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Industrial wastewater treatment
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Four general area air samples were collected and analyzed qualitatively for VOCs as shown in Table 4.++++Table 4 - "Identification of Volatile Organic Compounds in Area Air Samples" shows that PERC is present in the following two locations: 1) In Belt Press Room Near Grit Shooting Operation and 2) In Belt Press Room Near Instrument Panel Between #2 & #3 Belt Presses.
Number of Samples:	4
Number of Sites:	1
Type of Measurement or Method:	area
Worker Activity:	Metropolitan St. Louis Sewer District Lemay wastewater treatment plant. Concentrations of H2S ranged from non-detect around the aeration basins to 18 ppm at the incineration and filter building exhaust fans....the potential exists for overexposure to H2S. The employees" complaints of burning sensation in the nose, loss of breath, sore throat, eye irritation, nausea, and diarrhea have all been associated with H2S exposure.++++++Employees working in the incinerator and filter building should wear personal H2S monitors when the H2S concentrations approach 5 ppm (one half of the NIOSH REL) or higher in the press room area or near the belt presses.
Number of Workers:	There are 101 employees at the Lemay treatment plant. The breakdown is: maintenance, 30; operators, 43; janitors, 5; management, 13; instrument technicians, 8; and chemists, 2. There are three shifts per day.
Analytic Method:	General area air samples for VOCs were collected on charcoal tubes connected via tubing to battery powered sampling pumps calibrated to provide a volumetric air flow rate of 200 milliliters per minute (ml/min)" Analysis was performed by GC with flame ionization detection (GC/FID) according to NIOSH Methods 1003, 1500, 1501, and 1550 with modifications.

EVALUATION

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Source Citation:	Marlow, D. A.. 1996. Health hazard evaluation report no. HETA 94-0405-2551, Metropolitan St. Louis Sewer District, Lemay Wastewater Treatment Plant, St. Louis, Missouri.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970610

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	Low	× 2	6	Covers conditions of use in scope.Hydrogen sulfide (H2S) exposure is out of scope.
	Metric 4: Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1994)
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Sussell, A.,Singal, M.,Lerner, P. J.. 1993. Health hazard evaluation report no. HETA 90-226-2281, Alaska Airlines, Seattle, Washington.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970611

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Route of Exposure:	inhalation
Exposure Concentration (Unit):	A brief, relatively high concentration peak in total VOCs was measured at one seat location (72-176 ppm toluene equivalent); no unusual events or odors were associated with the event. The major compound identified in sampling for VOCs was ethanol; other compounds found in trace (non-quantifiable) concentrations including perchloroethylene.
Type of Measurement or Method:	area
Worker Activity:	A request was received from the Association for Flight Attendants for a NIOSH to evaluate potential employee exposures to toxic gases and/or a lack of oxygen aboard Alaska Airlines flights on MD-80 airplanes... The results indicated that cabin conditions commonly may not meet the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) comfort criteria for temperature, relative humidity, and carbon dioxide concentrations, particularly during gate time.
Number of Workers:	A company-maintained log of illness incidents among flight attendants was reviewed, as were medical records available for 44 (23 percent) of 192 potentially affected flight attendants. Of the 83 illness incidents from 1989 to April 1991, 30 (36 percent) occurred during the period April-June 1990, at a rate of about 1 per 1000 flight segments.
Engineering Control & percent Exposure Reduction:	Although probable explanations for some of the illnesses among flight attendants have been identified, the cause of most of the incidents remains undetermined, as does the reason for their increased rate of occurrence during the Spring of 1990 (but not, apparently, 1991). The decreased rate of occurrence after June 1990 followed Alaska Airlines implementation of the materials and procedural changes made in response to incident reports, but since there were no significant differences between the pre- and post-change environmental findings, we could not document that these changes were responsible for the decrease.++++++Alaska Airlines should continue to maintain a log of all reported illness incidents on its commercial flights.

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Source Citation:	Sussell, A.,Singal, M.,Lerner, P. J.. 1993. Health hazard evaluation report no. HETA 90-226-2281, Alaska Airlines, Seattle, Washington.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970611

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Analytic Method:		Four different methods (described in Table 2) were used to identify and quantify VOCs in the cabin air during the three test flights.			

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	USA
	Metric 3: Applicability	Unacceptable	× 2	8	exposure to background pollutants during Air transportation is not an included condition of use.
	Metric 4: Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (1990)
	Metric 5: Sample Size	Low	× 1	3	concentrations charactrerized as "trace", no other statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	most metadata given
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

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* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	White, G. L.,Schwartz, E.. 1979. Health hazard evaluation report no. HEE 79-41-594, Stout Sportswear, Queens Long Island City, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970612

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	unknown
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Table III "Results of Sampling for Organic Vapors" included PERC area and PBZ measurements; each were less than 0.5 mg/M3.
Number of Sites:	1
Type of Measurement or Method:	PBZ and area
Worker Activity:	The process evaluated involved pattern making for women's sportswear. The job categories included officer personnel, photomakers, markers , graders and cutters. The photomaker machine uses a solution called Super Diazol which is composed of primarily ammonium hydroxide. The clothing pattern ("photomaker") machine can produce airborne exposures to the substances evolved.
Number of Workers:	19NIOSH physicians interviewed all 19 employees via non-directive medical questionnaires.
Engineering Control & percent Exposure Reduction:	The photocopying machine must be maintained in good working condition at all times and there should be a routine maintenance program which includes inspection of the local exhaust ventilation ducts, fan , motor, etc . The operator must be taught the proper procedures for start up, operations , and shut down. The exhaust fans should be turned on before start-up and shut off after shut down to help prevent airborne emissions.
Analytic Method:	Personal and general area samples for airborne organic vapors were obtained utilizing both activated charcoal and silica gel tubes with calibrated battery pumps set at airflows of 0.05 and 0.2 liters per minute (1pm) .

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	CDC - NIOSH

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Source Citation:	White, G. L.,Schwartz, E.. 1979. Health hazard evaluation report no. HEE 79-41-594, Stout Sportswear, Queens Long Island City, New York.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970612

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Unacceptable	× 2	8	Description of PCE use not described
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1979)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burr, G. A.,Todd, W.. 1986. Health hazard evaluation report no. HETA 86-005-1679, Dutch Girl Cleaners, Springdale, Ohio.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970613

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	TABLE II "Results of Environmental Air Samples for Perchloroethylene" show the four area samples range in 8-hr TWA concentration from 79 to 135 mg/M3.
Number of Sites:	1
Type of Measurement or Method:	area
Engineering Control & percent Exposure Reduction:	General ventilation of dry cleaner is provided by a ceiling- mounted fan which exhausts air into a plenum formed by the suspended ceiling and the roof of the building. This plenum, shared by two other businesses in the enclosed pedestrian mall and accounts for the uniform distribution of PERC vapors in these areas.
Analytic Method:	Using charcoal tubes, four full-shift area samples for PERC were collected at various locations in the mall. Sample analysis was performed by gas chromatography with GC/FID according to NIOSH Method S-335.2 The limit of detection is 0.01 milligrams per cubic meter (mg/M3).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1986)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	Burr, G. A.,Todd, W.. 1986. Health hazard evaluation report no. HETA 86-005-1679, Dutch Girl Cleaners, Springdale, Ohio.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970613

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Eisenberg, J.,Ramsey, J.. 2010. Health hazard evaluation report no. HETA 2008-0175-3111, Evaluation of 1-Bromopropane use in four New Jersey commercial dry cleaning facilities.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970603

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	1-BP not perc exposure was measured.
Worker Activity:	Operators are those personnel who refill the machines with 1-BP and who load and unload clothes from the machine. Often the owner is also an operator. Employees, such as cashiers and press machine operators work in the facility but do not work with the dry-cleaning machine containing 1-BP.
Number of Workers:	Six interviews were conducted with owners, operators, and employees.In August 2008, NIOSH visited four dry cleaning facilities that had converted their systems from perc to 1-BP.
Engineering Control & percent Exposure Reduction:	Several perc alternatives are available to dry cleaning owners, including 1-BP, aliphatic hydrocarbons (DF-2000), silicone-based cleaner (GreenEarth"), carbon dioxide, and wet cleaning methods. However, 1-BP is the only perc alternative that can be used in the original perc machines with alterations.++++++++Generally accepted guidelines recommend 12 air changes per hour with a minimum of 30 cfm of outside air per person for dry cleaning establishments.
PPE:	PPE should be used until engineering and administrative controls can be demonstrated to be effective in limiting exposures to acceptable levels.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Low	× 2	6	Covers conditions of use in scope, but no Perc usage or exposure data was included. Study retained because of the information on polution prevention.

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Source Citation:	Eisenberg, J.,Ramsey, J.. 2010. Health hazard evaluation report no. HETA 2008-0175-3111, Evaluation of 1-Bromopropane use in four New Jersey commercial dry cleaning facilities.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970603

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (site visit 2008; published 2010).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Burkhart, J. E.,Jennison, E. A.. 1994. Health hazard evaluation report no. HETA 92-0297-2396, Exxon Chemical Company, Pottsville Film Plant, Polyethylene Film Department, Mar-Lin, Pennsyvlania.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970604

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Plastic and rubber products
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Trace amounts of the hydrocarbons 1,1,1-trichloroethane, cyclohexane, toluene, perchloroethylene, xylene isomers, and hexane were detected; but the amounts were insufficient to quantify.
Type of Measurement or Method:	PBZ and area
Worker Activity:	Polyethylene department of Exxon Chemicals" Employee concerns center around the problem of trapped gas being released from a bubble. The bubble does not spontaneously break, but is pierced by the operator. This may occur during a controlled shut down for a product change on the line or in the event of a "wrap-up" (film becomes entangled in the roller system).
Number of Workers:	41An environmental and medical survey of respiratory complaints was conducted June 7-9, 1993" Thirty-seven of the 41 current employees of the polyethylene department participated in the study.
Exposure Duration:	The polyethylene filming process operates 24 hours a day, seven days a week and is carried out by workers in eight-hour rotating shifts.
Engineering Control & percent Exposure Reduction:	Recommendations include the continuation of company environmental monitoring and medical surveillance programs. It is also recommended that all process technicians receive periodic training on the company's Safety Critical Procedure of "Removing Stagnant Bubble Air."

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	USA

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Source Citation:	Burkhart, J. E.,Jennison, E. A.. 1994. Health hazard evaluation report no. HETA 92-0297-2396, Exxon Chemical Company, Pottsville Film Plant, Polyethylene Film Department, Mar-Lin, Pennsyvlania.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970604

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1994)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Aggazzotti, G.,Fantuzzi, G.,Predieri, G.,Righi, E.,Moscardelli, S.. 1994. Indoor exposure to perchloroethylene (PCE) in individuals living with dry-cleaning workers. Science of the Total Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	21778

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Exposure Concentration (Unit):	PCE levels in dry-cleaners' homes proved to be significantly higher than in control houses (geometric means: 265 vs. 2 ug/m 3, P < 0.001).
Number of Sites:	Thirty apartments were visited housing dry-cleaners and their families, and located well away from the dry-cleaning premises. The same sampling procedure was followed in 25 private homes where samples of alveolar air were collected from 41 subjects who were not occupationally exposed and who acted as control group.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	method described but no metnion of NIOSH/OSHA method
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Italy (OECD)
	Metric 3:	Applicability	Unacceptable	× 2	8	Members of the household of dry-cleaners is not an included condition of use.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1994)
	Metric 5:	Sample Size	Medium	× 1	2	range, mean, media, given, no discrete data
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	metadata fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	Aggazzotti, G.,Fantuzzi, G.,Predieri, G.,Righi, E.,Moscardelli, S.. 1994. Indoor exposure to perchloroethylene (PCE) in individuals living with dry-cleaning workers. Science of the Total Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	21778

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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Source Citation:	Hake, C. L.,Stewart, R. D.. 1977. Human exposure to tetrachloroethylene: Inhalation and skin contact. Environmental Health Perspectives.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	58147

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Route of Exposure:	inhalation and dermal

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	controlled exposure scenarios, not applicable to occupational uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1977)
	Metric 5:	Sample Size	High	× 1	1	specific exposure concentrations given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Addressed variability by varying exposure concentrations
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McCarthy, T. B.,Jones, R. D.. 1983. Industrial gassing poisonings due to trichlorethylene, perchlorethylene, and 1,1,1-trichloroethane, 1961-80. British Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	75236

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)Dry cleaning solvent
Number of Samples:	44For 1961-80 inclusive, 330 gassing incidents involving these solvents were reported, affecting 384 people: 288 were affected by trichlorethylene, 44 by perchlorethylene, and 52 by 1-1-1 trichloroethane. Seventeen cases were fatal and of the remaining
Worker Activity:	Chlorinated hydrocarbon solvents have been used extensively over the past 100 years as degreasing agents" Probably the three most commonly used chlorinated hydrocarbon solvents in industry today are trichlorethylene, perchlorethylene, and 1-1-1 trichloroethane.The medical records of cases of industrial gassings reported to HM Factory Inspectorate"use of the solvents were classified according to whether: (1) the solvent was being used in a fixed tank installation, (2) maintenance of fixed tank installation was being carried out, (3) solvent was being used in portable form-that is, bucket solvent, (4) solvent was being used for dry cleaning process, or (5) other miscellaneous circumstances.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	peer-reviewed article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK (OECD)
	Metric 3:	Applicability	High	× 2	2	includes data for in scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1983)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						

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Source Citation:	McCarthy, T. B.,Jones, R. D.. 1983. Industrial gassing poisonings due to trichlorethylene, perchlorethylene, and 1,1,1-trichloroethane, 1961-80. British Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	75236

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Some discussion of uncertainty/variability
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Mundt, K. A.,Birk, T.,Burch, M. T.. 2003. Critical review of the epidemiological literature on occupational exposure to perchloroethylene and cancer. International Journal of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	195198

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation and dermal
Exposure Concentration (Unit):	None."A comprehensive search was conducted to identify all available epidemiological literature pertaining to the carcinogenic effects of PCE...The widespread lack of valid exposure measurements or other adequate indicators of potential for exposure were consistent limitations."
Number of Sites:	1991 = 28,100 dry-cleaning plants2000 = 30,000 dry-cleaning plants
Worker Activity:	1991 = 33 percent used an open transfer process2000 = 5 percent still employed transfer machinesAll others used a closed transfer process, which involves less potential for worker exposure.
Number of Workers:	An estimated 500,000 workers in the USA are potentially exposed to PCE, of whom 119,000 to 278,000 are employed in the drycleaning industry.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Applied Epidemiology, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Literature review was international.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 10 years old (2002)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						

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Source Citation:	Mundt, K. A.,Birk, T.,Burch, M. T.. 2003. Critical review of the epidemiological literature on occupational exposure to perchloroethylene and cancer. International Journal of Occupational and Environmental Health.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	195198

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	Limited discussion of the variability and uncertainty.
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Blair, A.,Petralia, S. A.,Stewart, P. A.. 2003. Extended mortality follow-up of a cohort of dry cleaners. Annals of Epidemiology.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	630365

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	None.Exposure assessment procedures were described in detail in the study on the earlier follow-up (Ref #4 " Blair A, Stewart PA, Tolbert PE, Grauman D, Moran FX, Vaught J, et al. Cancer and other causes of death among a cohort of dry cleaners. Br J Ind Med. 1990;47:162168).
Worker Activity:	Monitoring data from these studies indicated that levels were highest for jobs performed at the washers and progressively decreased with distance from the washing machines. Cleaners were assigned an exposure score of 40 (high exposure) for an eight-hour time-weighted-average (TWA) and persons working as pressers, sewers, or at the counter were given a score of seven (medium exposure). Cohort members employed at pick-up stations where no dry cleaning occurred were assigned as unexposed (little or no exposure), even though they would have had a higher exposure than the general population due to off-gassing from the cleaned garments.
Number of Workers:	The National Institute for Occupational Safety and Health (NIOSH) estimated that about 500,000 dry cleaners may have been exposed to tetrachloroethylene in the early 1980s

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the Department of Occupational Epidemiology, Branch Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD (A.B., P.A.S.); and Pfizer Pharmaceuticals, Inc., New York, NY.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (published in 2002; worker count from the 1980)

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Source Citation:	Blair, A.,Petralia, S. A.,Stewart, P. A.. 2003. Extended mortality follow-up of a cohort of dry cleaners. Annals of Epidemiology.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	630365

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruder, A. M.,Ward, E. M.,Brown, D. P.. 2001. Mortality in dry-cleaning workers: An update. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	630934

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation++++++++dermal
Exposure Concentration (Unit):	NIOSH studies have shown that an exposure level of less than 5 ppm can be achieved with well-maintained modern dry-to-dry equipment [Burroughs et al., 1999; Earnest et al., 1997].
Worker Activity:	Exposure depends on equipment type (transfer or combination washer - dryer) and extent of solvent recovery (charcoal absorber and/or water-cooled or refrigerated condenser) from the drum contents before the drum is opened on work practices (use of gloves and/or respirator, machine maintenance, number of loads per day, number of pounds per load); on shop layout; and on climate (open doors dissipate solvent but in the north in winter doors are not likely to be left open).++++++++++++++Dermal exposure to PCE has not been considered an important route of exposure in the dry-cleaning industry since the development of dry-to-dry machines. However, based on comparisons of end-exhaled breath and TWA breathing zone air levels of PCE during a recent pilot intervention, dermal exposures may signifcantly contribute to the overall absorbed doses of workers. In addition, transfer operation - separate washer and dryer - still prevail in thousands of dry cleaning shops. During the transfer the operator removes the still-damp items from the washer and puts them in the dryer. Because of this step, operator exposures in transfer shops average twice as high as in dry-to-dry shops.
Number of Workers:	500,000The National Occupational Exposure Survey (NOES) estimated that in the early 1980s over one-half million dry-cleaning plant employees and other industrial workers in over 40,000 plants potentially were exposed to PCE [NOES estimate, November 27, 1989].

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					

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Source Citation:	Ruder, A. M.,Ward, E. M.,Brown, D. P.. 2001. Mortality in dry-cleaning workers: An update. American Journal of Industrial Medicine.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	630934

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the National Institute for Occupational Safety and Health and the National Institute for Environmental Health Sciences.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (published in 2002; worker count from the 1989)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Weiss, N. S.. 1995. Cancer in relation to occupational exposure to perchloroethylene. Cancer Causes and Control.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	631151

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	"No measurements were made of any individuals exposure to PCE."
Worker Activity:	""Rather, persons were assigned a relative exposure score based on the job(s) they held within the indusrty. The cleaners themselves were estimated to have had the highest relative exposure, followed by pressers, sewers, counter workers, and maintenance workers."
Number of Workers:	500,000"At the present time, it is estimated that the more than 500,000 persons in the US are esposed occupationally to PERC, many of whom are employed in a dry-cleaning establishment."

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the University of Washington.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (published in 1995; worker count from the 1994)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Weiss, N. S.. 1995. Cancer in relation to occupational exposure to perchloroethylene. Cancer Causes and Control.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	631151

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	632416

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Route of Exposure:	dermal
Exposure Concentration (Unit):	Composition of Groundwater=2.170 mg/L
Worker Activity:	during showering The main objective of this study was to determine the effects of incremental exposure of workers in a metal degreasing and metal drying facility during showering at work with VOC-contaminated tap water.
Analytic Method:	...analyzed the water of 17 wells located in areas surrounding a metal degreasing and dry cleaning facility in northwestern Spain.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the University of Santiago de Compostela.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Spain
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 10 years old (2006)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of the variability and uncertainty.

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Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	632416

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	632416

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Exposure Concentration (Unit):	There was a large variation in exposure level across shops; the median annual level of all measurements was, however, fairly stable during 19641979 (Figure 2)...For comparison with external data, the mean of 53 measurements of ? 60 min for dry cleaners was 164 mg/m3.++++++++++++++Based on large U.S. samples of time-weighted- average measurements for machine operators from the 1980s, the exposure level was higher at transfer machines than at dry-to-dry machines: mean concentrations were 338 mg/m3 and 157 mg/m,3 respectively(IARC 1995).
Number of Samples:	168Only 168 tetrachloroethylene measurements were made in dry-cleaning shops in the Nordic countries between 1964 and 1979.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the University of Copenhagen.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Nortic Countries (Denmark, Norway, Sweden, and Finland)
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (published in 2006; worker exposure data from 1964 through 1980)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	632416

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970186

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Exhibit 4-4 Summarizes personal exposures. Minimum exposure concentration of 69 ppm (470 mg/m3) to 740 ppm (5000 mg/m3) Exhibits 4-5, 4-6 and 4-7 contain additiona exposure numbers.
Number of Samples:	386
Worker Activity:	All jobs, cleaner, spotter, manager, presser

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on OSHA monitoring
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	PCE dry cleaning data, though much of it is outdated technology
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1990-1993 - Monitoring data are from after the establishment of the PEL, but greater than 10 years old.
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by max and mean, with no other statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement, worker activity, but does not provide measurement duration or all sample locations
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.7	

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Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970186

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Eweres, L. M.. 1999. Health hazard evaluation report no. HETA 98-0249-2773, Grove Park Inn, Asheville, North Carolina.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970593

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Full-shift PBZ TWA ranged from 0.17 - 5.8 ppm/worker;area samples were 7.4 and 5.6 ppm.
Number of Samples:	7
Number of Sites:	2
Type of Measurement or Method:	TWA
Number of Workers:	5
Type of Sampling:	PBZ, area
Sampling Location:	above and behind door of dry cleaning machine, PBZ on all 5 workers
Analytic Method:	NIOSH Method 1003

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	PCE dry cleaning data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from almost 20 years ago (1999)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	sample type, measurement type, worker activities, exposure duration all given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	the report discusses areas of variability and uncertainty

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Source Citation:	Eweres, L. M.. 1999. Health hazard evaluation report no. HETA 98-0249-2773, Grove Park Inn, Asheville, North Carolina.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970593

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruhe, R. L.. 1980. Health hazard evaluation report no. HHE 80-37-725, Texaco, Incorporated, Casper Wyoming.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970596

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Welding

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	condition of use unclear
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from more than 20 years ago (1980)
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	most metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hervin, R. L.,Lucas, J.. 1973. Health hazard evaluation report no. HHE 72-35-34, The Budd Company, Automotive Division, Clinton, Michigan.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970601

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	solvents and/or degreasers
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	10-350 mg/M3 for PBZ,10-340 for area
Number of Samples:	21
Number of Sites:	3+
Number of Workers:	290 in production

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	degreasing with solvent containing perc
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1973 is after the PEL date of 1970
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	PBZ and area readings included, but little information on testing methods
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Not discussed
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McLouth, L. D.,Keenlyside, R.. 1981. Health hazard evaluation report no. HHE 80-100-798, Jehl Cooperage Company Inc., Memphis Tennessee.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970602

EXTRACTION

Parameter	**Data**

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Drum recondintioner may apply to disposal scenario
	Metric 4:	Temporal Representativeness	Low	× 2	6	1980
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			Medium		1.8	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1984. Health hazard evaluation report no. HETA 82-280-1407, Hoover Company, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970587

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Welding
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	.58 - 1.14 ug/m3
Number of Samples:	4 (all area)
Number of Sites:	1
Type of Measurement or Method:	charcoal sorbent
Worker Activity:	Welding
Type of Sampling:	Area
Sampling Location:	Supervisor's desk in welding shop
Exposure Duration:	7-8 hours
Analytic Method:	P&CAM S-335

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH health hazard evaluation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1983 - Monitoring data are from after the establishment of the PEL, but greater than 10 years old.
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement and sample types, worker activity, specific sample locations, but does not provide measurement duration

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Source Citation:	Hartle, R.,Aw, T. ar-Ching. 1984. Health hazard evaluation report no. HETA 82-280-1407, Hoover Company, North Canton, Ohio.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970587

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Evans, J. S.,Thompson, K. M.,Hattis, D.. 2000. Exposure efficiency: Concept and application to perchloroethylene exposure from dry cleaners. Journal of the Air and Waste Management Association (1990-1992).
Type of Data Source	Occupational Exposure; Published Models for Exposures or Releases;
Hero ID	2228721

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Physical Form:	vapor
Route of Exposure:	inhalation

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	model appears to be free of errors and based on sound approaches
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Model for ambient exposures by general population
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Older than 10 years
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	equation and parameter values, rationale for selection not provided for all parameters
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	variability does not appeared to be addressed in the model parameters
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kowalska, J.,SzewczyÅska, M.,PoÅniak, M.. 2014. Measurements of chlorinated volatile organic compounds emitted from office printers and photocopiers. Environmental Science and Pollution Research.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	2534318

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Ink and ink removal products
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.43ug/m3, 1.65ug/m3, 3.89ug/m3, 2.55ug/m3, 0.592ug/m3, 0.245ug/m3, 0.503ug/m3
Number of Sites:	7
Worker Activity:	Office worker
Type of Sampling:	desorption tubes
Sampling Location:	Sampling done in an exclosed measuring chamber
Exposure Duration:	5 hrs
PPE:	none

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Environmental Science Poll. Research Article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Poland
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included

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Source Citation:	Kowalska, J.,SzewczyÅska, M.,PoÅniak, M.. 2014. Measurements of chlorinated volatile organic compounds emitted from office printers and photocopiers. Environmental Science and Pollution Research.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	2534318

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Overall Quality Determination†	High		1.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Benignus, V. A.,Boyes, W. K.,Geller, A. M.,Bushnell, P. J.. 2009. Long-term perchloroethylene exposure: A meta-analysis of neurobehavioral deficits in occupationally and residentially exposed groups. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	633141

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	0.0 ppm to 31.0 ppm measured individual subjects.
Worker Activity:	Employees of dry cleaners
Number of Workers:	35
Exposure Duration:	0 to 540 ppm-h/1000[concentration (ppm) " time (h)]/1000.0

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	The "Journal of Toxicology and Environmental Health" is a high quality journal; the authors are employed by trusted sources (i.e., EPA and University of NC).
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Original data over 20 years old.Cavalleri et al. (1994)
	Metric 5:	Sample Size	Medium	× 1	2	Mean and range are provided. It is unclear if analysis is representative.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Primary reference might include additional metadata related to the release but it was not included in this publication.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	This journal article does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Boice, J. D., Jr.,Marano, D.,Fryzek, J.,Sadler, C.,McLaughlin, J. K.. 1999. Mortality among aircraft manufacturing workers. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	699183

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Worker Activity:	Perchloroethylene replaced TCE at the Lockheed Martin factories in 1966 and was used primarily in vapour degreasing activities...Workers typically were not exposed to single chemicals, but rather to various solvents and substances depending on job activities.
Analytic Method:	From this information we identified job families (groups of occupations with similar work activities) and job titles with potential for the exposure of interest, and duration of exposure.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	The "Occup Environ Med" is a journal; the authors are employed by a trusted source (i.e., International Epidemiology Institute in Rockville MD).
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data older than 20 years
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of uncertainty/variability

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Source Citation:	Boice, J. D., Jr.,Marano, D.,Fryzek, J.,Sadler, C.,McLaughlin, J. K.. 1999. Mortality among aircraft manufacturing workers. Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	699183

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cdc,. 1997. Control of exposure to perchloroethylene in commercial drycleaning (Mashine Design).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045100

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	See figure 1, "Operator exposure when loading or unloading a dry-to-dry, refigerated, drycleaning machine vs. same machine with a retrofitted large, closed-loop, carbon absorber used as a secondary vapor control system."
Engineering Control & percent Exposure Reduction:	To reduce exposure engineering measures should be considered: 1) studies report that 30 percent to 70 percent of garments drycleaned using PERC can be wet cleaned; 2) drycleaning machines should be isolated from other work areas; 3) follow manufacturer maintenance recommendations; 4) ventilation e.g., inward air velocity through the loading door of 100 fpm, complete air change should occur in the work room every 5 minutes; 5) work practices e.g., use a tool with a long handle to retrieve clothes at the back of the drum.
PPE:	Workers should wear proper personal protective equipment (gloves, goggles, and respirators) to reduce exposures to PERC during maintenance activities.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC , NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Technical guidance and exposure data is over 20 years old (1997)
	Metric 5:	Sample Size	Low	× 1	3	uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						

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Source Citation:	Cdc,. 1997. Control of exposure to perchloroethylene in commercial drycleaning (Mashine Design).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045100

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2014. Degreasing with TCE in commercial facilities: Protecting workers.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045553

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Engineering Control & percent Exposure Reduction:	Cleaning method alternatives might also meet cleaning needs: 1) Low-solids fluxes leave behind less residue on circuit boards eliminating the need for solvent cleaning; 2) Bake-off ovens for components that can withstand high heat. 3) Water-based cleaning solutions, 4) closed-loop vapor degreaser
PPE:	"If you use TCE-based degreasers, you should always wear proper personal protective equipment (PPE). Effective types of PPE are described below"" e.g., solvent-resistant gloves; chemical splash goggles, eye wash stations, respirators.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Prepared by Eastern Research Group, Inc. and presented at the TCE Expert Public Workshop.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Occupational scenario within the scope of the risk evaluation, but the focus of the article is TCE not PERC.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (cites references published in 2011)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	U.S, E. P. A.. 2014. Degreasing with TCE in commercial facilities: Protecting workers.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045553

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Marano, D. E.,Boice, J. D., Jr.,Fryzek, J. P.,Morrison, J. A.,Sadler, C. J.,McLaughlin, J. K.. 2000. Exposure assessment for a large epidemiological study of aircraft manufacturing workers. Applied Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	699188

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Physical Form:	vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Long-term: 0.06 - 27 ppm, mean- 9.5 ppm, median- 3Short-term: 1.7 - 150 ppm, mean- 55.7 ppm, median- 17
Number of Samples:	Long-term: 6Short-term: 70
Worker Activity:	Vapor degreasing operations
Sampling Location:	Near degreasers
Exposure Duration:	Long-term: 8 hour weighted avg.Short-term: "instant" readings

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Int'l Epidemiology Institute
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	covers in scope uses
	Metric 4:	Temporal Representativeness	Low	× 2	6	Article is dated 2000, but most data are older
	Metric 5:	Sample Size	Medium	× 1	2	statistics given but discrete data not available
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Data not fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included

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Source Citation:	Marano, D. E.,Boice, J. D., Jr.,Fryzek, J. P.,Morrison, J. A.,Sadler, C. J.,McLaughlin, J. K.. 2000. Exposure assessment for a large epidemiological study of aircraft manufacturing workers. Applied Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	699188

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lipworth, L.,Sonderman, J. S.,Mumma, M. T.,Tarone, R. E.,Marano, D. E.,Boice, J. D.,McLaughlin, J. K.. 2011. Cancer mortality among aircraft manufacturing workers: an extended follow-up. Journal of Occupational and Environmental Medicine.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1235276

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	peer-reviewed article
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	in scope use
	Metric 4:	Temporal Representativeness	Low	× 2	6	data evaluated from prior to PEL (1960) through 2008
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Fleming, D. A.,Woskie, S. R.,Jones, J. H.,Silver, S. R.,Luo, L.,Bertke, S. J.. 2014. Retrospective Assessment of Exposure to Chemicals for a Microelectronics and Business Machine Manufacturing Facility. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	2128566

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Physical Form:	vapor
Route of Exposure:	inhalation
Worker Activity:	component placement in circuit board manufacture
Number of Workers:	4041

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Retrospective study with few actual numbers
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	Medium	× 1	2	statistics given but discrete data not available
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability not discussed
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ncdeq,. 2017. Information summary for Stony Hill Road TCE site in Wake county.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982617

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Worker Activity:	Two small circuit board assembly companies contaminated well water; exposures from vapor intrusion and groundwater are discussed.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	State regulator i.e., NC Dept. of Environment and Natural Resources
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Covers conditions of use in scope, but all exposures are to the general population.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2012).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources generally described, some details missing
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Fl, D. E. P.. 2002. Gulf States Chemical: County Road 158: Lloyd, Florida: Jefferson County: Northeast district: Site lead: Waste cleanup program: Approved for cleanup: February 28, 2002: HWC # 131.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986456

EXTRACTION

Parameter	Data
Life Cycle Stage:	Distribution in commerce
Life Cycle Description (Subcategory of Use):	Distribution
Worker Activity:	The plant received an estimated 15 drums containing chemical residues daily during the period of operation. These drums were rinsed and refilled with other chemicals for sale and distribution. Tank rinsate was discharged to the evaporation/percolation ponds. PCE exceeded drinking water standards in the Floridan aquifer.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	unspecified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Covers conditions of use in scope, but all exposures are to the general population.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	data from over 10 years ago
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources generally described, some details missing
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

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Source Citation:	Fl, D. E. P.. 2002. Gulf States Chemical: County Road 158: Lloyd, Florida: Jefferson County: Northeast district: Site lead: Waste cleanup program: Approved for cleanup: February 28, 2002: HWC # 131.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986456

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale:
High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cdc/Niosh,. Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986505

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Exposure Concentration (Unit):	Includes exposure limits i.e., NIOSH REL and OSHA PEL

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Contain only physical /chemical properties which apply to all COUs
	Metric 4:	Temporal Representativeness	High	× 2	2	date unclear but physical properties are assumed to be relevant to current conditions
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	data sources not fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Larranaga, M. D.,Lewis, R. J.,Lewis, R. A.. 2016. Hawley's Condensed Chemical DictionaryPerchlorobenzene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982125

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Exposure Concentration (Unit):	lists generic hazards: "Irritant to eyes and skin. Central nervous system impairment. Probable carcinogen."
Worker Activity:	lists generic uses: Dry-cleaning solvent, vapor-degreasing solvent, drying agent for metals and certain other solids, vermifuge, heat-transfer medium, manufacture of fluorocarbons.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Hawley's Condensed Chemical Dictionary
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Contain only physical /chemical properties which apply to all COUs
	Metric 4:	Temporal Representativeness	High	× 2	2	date unclear but physical properties are assumed to be relevant to current conditions
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	data sources not fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†			High		1.5	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2017. Chlorinated solvents: Glossay.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982129

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	The German federal authorities (LAS) published a comprehensive guidance on the safe use of PER in drycleaning based on German regulations (2. BImSchV in force since 1990)" if PER is applied according to regulations such as the 2. BImSchV and exposure is very low, well below the current German OEL.
Worker Activity:	Perchloroethylene or tetrachloroethylene is the primary solvent used in the industrial and commercial dry?cleaning of clothes.
Engineering Control & percent Exposure Reduction:	The chemical industry sponsors research on the possible environmental and health risks of chlorinated solvents. It also participates actively in the preparation of guidelines for safe handling, working closely with its customers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (glossary publication date isn't listed, but "news briefs" are recent i.e., 2017).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	European Chlorinated Solvents, Association. 2017. Chlorinated solvents: Glossay.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982129

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Product safety summary on perchloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982135

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation
Worker Activity:	Perchloroethylene is the primary solvent used in industrial and professional dry cleaning" Higher worker exposures are likely in industrial or professional dry cleaning and surface cleaning however modern cleaning machines reduce dramatically emissions.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Product safety summary on perchloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982135

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Route of Exposure:	inhalation
Worker Activity:	Worker exposure can occur in Perchloroethylene manufacturing facilities or the industrial facilities where the substance is used as an intermediate. Since this type of activity is mainly undertaken in closed systems, exposure is fairly low.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial useProcessing
Life Cycle Description (Subcategory of Use):	Dry cleaning solventIntermediate in basic organic chemical manufacturing
Route of Exposure:	inhalation
Exposure Concentration (Unit):	In Europe, the Scientific Committee on Occupational Exposure Limits (SCOEL) published the following recommendation in 2009:* 8 hour OEL (TWA): 20 ppm (138 mg/m3)* 15 min STEL (TWA): 40 ppm (275 mg/m3)Derived No Effect Levels (DNELs) for Workers derived under REACH:* DNEL inhalation long term, systemic effects: 20 ppm (138 mg/m3)* DNEL inhalation short term, systemic effects: 40 ppm (275 mg/m3)
Worker Activity:	Inhalation of solvent vapour is the most frequent route of exposure: solvent vapours are heavier than air and can accumulate in confined or poorly ventilated areas.++++++++++++There are general worker health surveys and studies specifically investigating potential effects on the liver and kidney in workers likely exposed to perchloroethylene. Based on all available data, there is no clear or consistent evidence from studies in humans for repeated dose effects of perchloroethylene at exposure levels up to a level of 20 ppm (138 mg/m3). This concentration can be regarded to be a no-observed-adverse-effect concentration NOAEC in humans as an 8-hour timeweighted- average (TWA) value.
Engineering Control & percent Exposure Reduction:	Good ventilation is essential in areas where the product is made or used.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).

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Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial useProcessing
Life Cycle Description (Subcategory of Use):	Dry cleaning solventIntermediate in basic organic chemical manufacturing
Route of Exposure:	dermal
Exposure Concentration (Unit):	Derived No Effect Levels (DNELs) for Workers derived under REACH:* DNEL dermal long term, systemic effects: 39.4 mg/kg bw/daySelf-classification by the REACH consortium after GHS criteria (Regulation EC 1272/2008):* Skin corrosion /irritation Cat 2: H315 Causes skin irritation* Skin Sens. 1B: H317: May cause an allergic skin reaction.
Worker Activity:	There is sufficient evidence both from human cases and toxicology studies showing that perchloroethylene is a weak skin irritant, but not corrosive. In one case report, extensive redness (erythema) and blistering were seen on a worker who had lain unconscious in a pool of solvents for about five hours. In a second case report, another worker who had been unconscious for half an hour while wearing clothes soaked in perchloroethylene showed similar symptoms.
PPE:	Perchloroethylene tested positive in the local lymph node assay in mice. Therefore, classification according to Directive 67/548/EEC and the EU Classification, Labelling and Packaging of Substances and Mixtures (CLP) Regulation (EC) No. 1272/2008 for skin ensitisation is required.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)

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Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.5	

⋆ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2014. Public health assessment: Technitronics site: Casselberry, Seminole County, Florida: FDEP facility ID: COM_275450: EPA facility ID: FLD007432552.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982222

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Exposure Concentration (Unit):	Workers and others on the site are not at risk from chemicals in surface soil or from vapor intrusion" FDEP did not find elevated solvent levels in on-site surface soil, soil gas, or indoor air. Because solvents at the groundwater surface are limited to areas away from on-site buildings, vapor intrusion is unlikely.
Worker Activity:	The two-acre Technitronics site in Casselberry Florida. From 1968 to 1997, several businesses used chlorinated solvents to clean circuit boards and tools, and to make dry cleaning solution.Recent testing found two types of groundwater contamination under the site but very little surface soil contamination.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ATSDR
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Covers conditions of use in scope, but the purpose of this report is to assess the public health threat from contaminated soil, indoor air, and groundwater at and near the site.
	Metric 4:	Temporal Representativeness	High	× 2	2	data less than 10 years old
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						

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Source Citation:	Atsdr,. 2014. Public health assessment: Technitronics site: Casselberry, Seminole County, Florida: FDEP facility ID: COM_275450: EPA facility ID: FLD007432552.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982222

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	not addressed
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Co, D. O. H.. 1992. Lessons learned in pollution prevention: Case studies of three print shops.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982089

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Solvent-based paints and coatings
Number of Sites:	3
Number of Workers:	The print shops ranged in size from a five-person, basic offset printing and photocopying operation to a 20-person, full service shop.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Colorado Department of Health
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	US with site visits to 3 Colorado print shops
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1992)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	In 1989, the OSHA lowered the PEL for perchloroethylene from 100 ppm to 25 ppm for an 8-hour TWA, as part of an overall PEL update. This action was overturned by a federal court in 1993, however, and the PELs for perchloroethylene reverted to the former limits. OSHA has urged employers not to roll back measures they may have taken to comply with the lower limits that were overturned, and several states that adopted the lower 1989 limit have not adopted the higher limit.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Biodegradation in water: screening tests: Tetrachloroethylene, Part 2.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970794

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Exposure Concentration (Unit):	Table of typical and Reasonable Worst Case exposures for dry cleaning on page 41. Typical long-term 8 ppm inhalation, 15 mg/kg/day dermal
Number of Samples:	4147

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	UK Govn't
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Published 2008, but much of the data are older
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, andassumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included
Overall Quality Determination†			Medium		1.8	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Biodegradation in water: screening tests: Tetrachloroethylene, Part 2.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970794

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Exposure Concentration (Unit):	Table of typical exposures for dry cleaning on page 43. Typical long-term 10 ppm inhalation, 6 mg/kg/day dermal
Number of Samples:	52

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	UK Govn't
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Published 2008, but much of the data are older
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, andassumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1997. Hazard control: Control of exposure to perchloroethylene in commercial drycleaning (ventilation) (HC 19).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974940

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Engineering Control & percent Exposure Reduction:	Ventilation to control exposure by capturing vapors and removing contaminant (local ventilation) or diluting the concentration before it reaches a worker's breathing zone (general ventilation). Also, Emergency ventilation in the case of a leak or spill. (Diagrams included)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Only mentions control options without exposure numbers or percent reduction
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1997
	Metric 5:	Sample Size	N/A		N/A	not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	N/A		N/A	not applicable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1978. Current intelligence bulletin 20: tetrachloroethylene (perchloroethylene).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Number of Workers:	500000
Engineering Control & percent Exposure Reduction:	Engineering and work place practice controls, checked every 3 months (e.g., air velocity, static pressure, or air volume); use of respirators
PPE:	Gloves, face shields

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Doesn't provide study numbers, but does address applicable uses and exposures
	Metric 4:	Temporal Representativeness	Low	× 2	6	Most data 1977 or earlier
	Metric 5:	Sample Size	N/A		N/A	not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	N/A		N/A	not applicable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2012. Drycleaning.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978136

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Engineering Control & percent Exposure Reduction:	To reduce exposure to drycleaning solvents, a comprehensive control approach should befollowed involving engineering measures, work practices, and personal protection.Engineering measures are the preferred and most effective means of control and shouldgenerally considered first.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Doesn't provide study numbers, but does address applicable uses and exposures
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Most data 1990s
	Metric 5:	Sample Size	N/A		N/A	not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	N/A		N/A	not applicable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2016. Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978134

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
PPE:	Respirator Recommendations: At concentrations above the NIOSH REL, or where there is no REL, at anydetectable concentration:(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece andis operated in a pressure-demand or other positive-pressure mode(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operatedin a pressure-demand or other positive-pressure mode in combination with anauxiliary self-contained positive-pressure breathing apparatusEscape:(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style,front- or back-mounted organic vapor canisterAny appropriate escape-type, self-contained breathing apparatus

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Doesn't provide study numbers, but does address applicable uses and PPE
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	N/A		N/A	not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	N/A		N/A	not applicable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable

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Source Citation:	Niosh,. 2016. Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978134

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1997. Hazard control: Control of exposure to perchloroethylene in commercial drycleaning (substitution) (HC 17).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974933

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasing
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation/dermal
Engineering Control & percent Exposure Reduction:	Provides alternatives to PERC as a control option

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Doesn't provide study numbers, just mentions benfits/risks of using alternatives to PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1997
	Metric 5:	Sample Size	N/A		N/A	not applicable
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	N/A		N/A	not applicable
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McComas, C.. 1996. Dry cleaning equipment upgrades cut costs and reduce perc.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982078

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Minnesota Labor and Industry Department (MNOSHA) requires dry cleaner shops keep the perc concentration under 25 ppm during an 8-hr period...This law is stricter than the federal OSHA standard.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Small Businesses Assistance Program (SBAP) at the Minnesota Pollution Control Agency
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1996)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lighthouse Communications, Group. 2017. Dry cleaners: Switch to wet cleaning process.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982081

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Number of Samples:	1
Worker Activity:	Major benefit of switch to wet cleaning process was an improved worker health and safety and reduced liability.Obstacle: Successful wet cleaning takes skill and experience, and a learning curve is involved in the process change. Special finishing (pressing) equipment is required (wet cleaned garments are more difficult/ time consuming to press without special equipment).
Number of Workers:	19

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Colorado Department of Public Health and Environment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1995)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	University of, Minnesota. 2017. Dry cleaners; Waste and emission reduction alternatives.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982082

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Minnesota Labor and Industry Department (MNOSHA) requires dry cleaner shops keep the perc concentration under 25 ppm during an 8-hr period...This law is stricter than the federal OSHA standard.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Minnesota Technical Assistance Program, University of Minnesota
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1997)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cohen, L.. 1992. Special report: Dry cleaning fumes cause health worries, push search for alternatives.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3982086

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Exposure Concentration (Unit):	Inspections by OSHA around the country have found up to 32 ppm in indoor air in the vicinity of dry cleaners.
Number of Workers:	Dry cleaners are predominantly small businesses, employing an average of eight people per plant.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Article is publised in a journal (i.e., The Neighborhood Works) that is not peer reviewed; the techniques used in the report are not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1992 - Monitoring data are from after the establishment of the PEL, but greater than 10 years old.
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by max, with no other statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Lacks most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hhs,. 1976. Occupational health guideline for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978138

EXTRACTION

Parameter	Data
Life Cycle Stage:	ProcessingIndustrial useCommercial/consumer use
Life Cycle Description (Subcategory of Use):	Intermediate in basic organic chemical manufacturingSolvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)Cleaners and degreasers (other); Dry cleaning solvent
Route of Exposure:	Inhalation, dermal
Exposure Concentration (Unit):	OSHA standard is 100 ppm averaged over an 8-hour work shift, with a ceiling level of 200 ppm and a maximum acceptable peak of 300 ppm for 5-minutes in any 3-hour period.NIOSH has recommended that the PEL be reduced to 50 ppm (339 mg/m3) averaged over a work shift of up to 10- hrs/day, 40 hrs/wk with a ceiling level of 100 ppm (678 mg/m3) averaged over a I5-minute period. In an industrial exposure to an avg conc. of 275 ppm for 3 hours, followed by 1100 ppm for 30 minutes, a worker lost consciousness; there was apparent clinical recovery 1-hour after exposure, but the monitored conc. in the patient's expired air diminished slowly over a 2-week period.
Engineering Control & percent Exposure Reduction:	Process enclosure; local exhaust ventilation; general dilution; personal protective equipment
PPE:	Employees should have impervious clothing, gloves, face shields (8" min), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquidNon-impervious clothing which becomes contaminated with liquid tetrachloroethylene should be removed promptly and not reworn until the tetrachloroethylene is removed from the clothing.Special precautions: Liquid tetrachloroethylene will attack some forms of plastics, rubber, and coatings.
Analytic Method:	Sampling and analyses may be performed by collection of vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure tetrachloroethylene may be used. An analytical method for tetrachloroethylene is in the NIOSH Manual of Analytical Methods. 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4).

EVALUATION

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Source Citation:	Hhs,. 1976. Occupational health guideline for tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978138

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	× 2	6	Data over 20 years old (1978)
	Metric 5: Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2014. International chemical safety cards (ICDC): Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978155

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Route of Exposure:	Inhalation, dermal
Exposure Concentration (Unit):	TLV: 25 ppm as TWA, 100 ppm as STEL; BEI issued; (ACGIH 2004).MAK: skin absorption (H); Carcinogen category: 3B; (DFG 2004).OSHA PEL: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)NIOSH REL: Ca Minimize workplace exposure concentrations.NIOSH IDLH: Ca 150 ppm
Engineering Control & percent Exposure Reduction:	Ventilation, local exhaust, or breathing protection
PPE:	Protective gloves. Protective clothing. Safety goggles, face shield.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Health & Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Condition of use is not specified; however, the information can be related to conditions of use that are in scope.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (modified: August 2015)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

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Source Citation:	Niosh,. 2014. International chemical safety cards (ICDC): Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978155

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 2017. Permissible exposure limits: OSHA annotated Z-2 table.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978316

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Exposure Concentration (Unit):	OSHA PELs: 100 ppm = 8-hr Time Weighted Average; 200 ppm = acceptable ceiling concentration;Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift=300 ppm; Maximum Duration = 5 min in any 3 hrCal/OSHA PEL = 25 ppm; (ST) 100 ppm; (C) 300 ppmACGIH 2017 TLV = 25 ppm; (ST) 100 ppm

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Exposures are occupational limits not true exposures.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2016)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 1999. Sampling and analytical methods: Tetrachloroethylene trichloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978317

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Analytic Method:	OSHA Method 1001Procedure: Adsorbent tube samples collected by drawing workplace air through coconut shell charcoal tubes using personal sampling pumps. Diffusive samples collected by exposing SKC 575002 Passive Samplers to workplace air. Samples extracted with carbon disulfide and extracts are analyzed by GC using FID.Analysis done at the OSHA Salt Lake Technical Center (SLTC).Detection limits of analytical procedure is 16.2 pg...Recommended air volume and sampling rate for charcoal tube samples and recommended exposure time for SKC 575-002 Samplers...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Description of measurement method
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1999)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Describes the precision of the overall proceedure and elements of the measurement method.
Overall Quality Determination†			High		1.5	

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Source Citation:	Osha,. 1999. Sampling and analytical methods: Tetrachloroethylene trichloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978317

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 2017. Respiratory protection eTool: Respirator change schedules: Using a math model table to determine a cartridge.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978321

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
PPE:	Resource provides respirator breakthrough times as a function of concentration ppm (e.g., 609 minutes at 100 ppm). There are factors that can reduce cartridge service life (e.g., high temperature, high relative humidity, multiple contaminants)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Condition of use is not specified; however, the information can be related to conditions of use that are in scope.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Assume data less than 20 years old; publication date not specified, but several document contains references from the late 1990s.
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Describes the environmental conditions which could impact cartrage breakthrough e.g., high temperatures.
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 2017. Respiratory protection eTool: Respirator change schedules: Using a math model table to determine a cartridge.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978321

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Exposure Concentration (Unit):	Excerpt from CFR (i.e., 29 CFR Subpart Z - 910.1000 table Z-2); 8-hour TWA exposure limit = 100 ppm

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Exposures are occupational limits not true exposures.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (amended in 2006)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carex, Canada. 2017. Tetrachloroethylene– Occupational Estimate.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978374

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	1) Solvent-based paints and coatings, including for chemical milling2) Dry cleaning solvent
Worker Activity:	When examining exposure to tetrachloroethylene by occupation, the largest group of workers exposed is printing press operators (who are mostly men). Other important occupational groups include drycleaning and laundry occupations, labourers in textile processing, and chemical technologists and technicians.
Number of Workers:	15,000 Canadians

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	CAREX Canada is a multidisciplinary team of researchers based at the Faculty of Health Sciences at Simon Fraser University
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Canada is in the OECD country
	Metric 3:	Applicability	Low	× 2	6	Exposures are occupational limits not true exposures.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2017)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual exposure data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carex, Canada. 2017. Trichloroethylene– Occupational Estimate.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978381

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Worker Activity:	When TCE exposure is examined by occupation, the largest exposed groups are "metalworking machine operators," "other metal products machine operators," "plating, metal spraying and related operators," and "labourers in metal fabrication," with 2,300 workers exposed. All these occupations have metal degreasing as part of their job.
Number of Workers:	9,800 Canadians

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	CAREX Canada is a multidisciplinary team of researchers based at the Faculty of Health Sciences at Simon Fraser University
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Canada is an OECD country
	Metric 3:	Applicability	Unacceptable	× 2	8	Information is for TCE not PERC
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2017)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Carex, Canada. 2017. Trichloroethylene– Occupational Estimate.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978381

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Navigant Consulting, Inc. 2016. Energy savings potential and RDandD opportunities for commerical building appliances (2015 update).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974987

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Number of Workers:	Most commercial dry-cleaning facilities are "mom and pop" businesses, although there is a considerable range in size of these businesses. A typical dry-cleaning business employs several employees and has one or 2 dry-cleaning units.
Engineering Control & percent Exposure Reduction:	Alternative dry-cleaning systems (i.e., ozone and liquid CO2) are descibed, but the focus is less energy consumption.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US DOE
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Medium	× 2	4	Occupational scenario within the scope of the risk evaluation, but information is general.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2016)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Markowitz, S. teven,Scarbrough, C. arl,Kieding, S. ylvia,Griffon, M. ark. 2004. Y-12 and Oak Ridge National Laboratory medical surveillance program, Phase I: Needs assessment.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974971

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Worker Activity:	TCE and perchloroethylene were used extensively throughout the history of the sites. The areas where potential exposures were the greatest included the pilot separation or processing buildings and the machine shops. Participants in the risk mapping sessions indicated that the machinists would "use perc to put out chip fires while machining uranium". They indicated they would 'use it for everything'.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US DOE
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2004)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Markowitz, S. teven,Scarbrough, C. arl,Kieding, S. ylvia,Griffon, M. ark. 2004. Y-12 and Oak Ridge National Laboratory medical surveillance program, Phase I: Needs assessment.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974971

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Foundry applications
Worker Activity:	The material came to the 0-Wing out of the casting furnace and at the 0-Wing that would form into a billet (using the baths) and roll into a plate"the Oil Baths used DAG, Perchloroethylene, and Freon as lubricants

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US DOE
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2004)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1977. Control of volatile organic emissions from solvent metal cleaning.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827321

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Exposure Concentration (Unit):	Solvent evaporation losses from typical air-agitatead, pump-agitated, and unagitated cold cleaners in the following units: ml/hr/m2 and g/hr/m2 (tables 1 through 4; pages 184 through 187).
Engineering Control & percent Exposure Reduction:	Conveyorized vapor degreasers, control cost estimates will be presented for facilities that primarily use trichloroethylene or perchloroethylene solvents. Data on two pollution control techniques is presented: 1) carbon adsorber and 2) refrigerated chillers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Medium	× 2	4	Air emission rates and pollution control. Could be considered in occupational exposure models.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1977)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		2.1	

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Source Citation:	U.S, E. P. A.. 1977. Control of volatile organic emissions from solvent metal cleaning.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827321

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2012. Worker health study summaries.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978135

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation, dermal
Exposure Concentration (Unit):	OSHA permissible exposure limit (PEL) for perc is 100 ppm over an 8-hour time-weighted average. A peak exposure should not exceed 200 ppm. for 5 minutes in any 3-hour period. In California and a few other states, the PEL is 25 ppm.
Worker Activity:	About 90 percent of all dry-cleaning plants still use perc as a dry-cleaning fluid" Today exposure levels in dry-cleaning shops are much less than they were 30 or 40 years ago. If you still work at a dry-cleaning shop, how you do your work and engineering controls can reduce your exposure.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Focus is health impact (e.g., cancer, mortality) resulting from PERC exposure
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years ago (1996)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Low		2.3	

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Source Citation:	Niosh,. 2012. Worker health study summaries.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978135

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2016. Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978134

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Route of Exposure:	inhalation, dermal
Exposure Concentration (Unit):	Exposure Limits: 1) NIOSH REL* Ca Minimize workplace exposure concentrations. 2) OSHA PEL* TWA 100 ppm* C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppmAlso includes respirator recommendations
PPE:	Personal Protection/SanitationSkin:Prevent skin contactEyes:Prevent eye contactWash skin:When contaminatedRemove:When wet or contaminatedChange:No recommendationProvide:Eyewash, Quick drench
Analytic Method:	Measurement MethodsNIOSH 1003 ;OSHA 1001See: NMAM or OSHA MethodsMEDICAL TESTS: 0179

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Also includes PERC physical attributes (e.g., molecular weight)
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2016)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Niosh,. 2016. Tetrachloroethylene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978134

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1997. Hazard control: Control of exposure to perchloroethylene in commercial drycleaning (substitution) (HC 17).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974933

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation, dermal
Worker Activity:	Perchloroethylene (PERC) is the most commonly used drycleaning solvent.
Engineering Control & percent Exposure Reduction:	Two potential alternatives to PERC are now on the market: Wetcleaning and Petroleum-Based Drycleaning... 1) At least 30 percent , and potentially a much higher percentage, of garments drycleaned using PERC can be wet cleaned satisfactorily while controlling fabric deterioration and shrinkage. 2) Petroleum-based drycleaning machines have had several technical advances to improve machine safety and reduce the risk of fire and explosion. These advances include vacuum technology, inerting with nitrogen, and better control of machine operating parameters. 3) Liquid Carbon Dioxide (CO2) is a recently developed technology that may become commercially available in 1998.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Occupational scenario within the scope of the risk evaluation, but limitations
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years ago (1997)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Niosh,. 1997. Hazard control: Control of exposure to perchloroethylene in commercial drycleaning (substitution) (HC 17).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974933

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2010. Health consultation: Chlorinated solvent contamination Elite dry cleaning facility (aka elite laundry company): Jaffrey, Cheshire County, New Hampshire.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970465

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Route of Exposure:	inhalation, oral
Exposure Concentration (Unit):	If exceedences of GW2 groundwater guidelines for CVOCs occur within 30 feet occupied buildings, further indoor air testing should be conducted (if possible when meteorological conditions create a frozen ground or low temperatures in the vadose zone).Analysis from test pits, soil gas samples and sludge indicate that PCE contamination exists on the Elite Laundry site... PCE was present at detectable levels in all soil gas samples.PCE from the Elite Laundry site has contaminated the groundwater beneath the Elite site property.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ATSDR
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Contamination from accidental release and the resulting exposures to the general population are out of scope.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2010)
	Metric 5:	Sample Size	N/A		N/A	No Comment.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	not addressed

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Source Citation:	Atsdr,. 2010. Health consultation: Chlorinated solvent contamination Elite dry cleaning facility (aka elite laundry company): Jaffrey, Cheshire County, New Hampshire.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970465

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Halogenated Solvents Industry Alliance, Inc.. 2018. Comment letter of Halogenated Solvents Industry Alliance, Inc. (HSIA) regarding Docket ID: EPA-HQ-OPPT-2016-0732-0097.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5371877

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for manufacturing
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2010)
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1983. RESULTS OF 1982 PERSONNEL MONITORING - PERCHLOROETHYLENE/CARBON TETRACHLORIDE PRODUCTION AREA.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214217

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Described, but not indicated as an OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for manufacturing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1984. INDUSTRIAL HYGIENE SURVEYS DURING 1983 AT THE EASTERN DIVISION MARINE TERMINAL AT JOLIET, ILLINOIS (SANITIZED).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214221

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Repackaging

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Described, but not indicated as an OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	data for marine terminal repackaging
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1983. 1982 INDUSTRIAL HYGIENE SURVEY ENVIRONMENTAL OPERATIONS DEPARTMENT.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214218

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Reactant

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Described, but not indicated as an OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Condition of use unclear, but appear to be relevant to industrial conditions of use
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Orris, P; Daniels, W. 1981. Health Hazard Evaluation Report 80-201-816: Peterson/Puritan Company. HE 80-201-816.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099140

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for formulation (aerosol packing)
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2002. In-depth survey report: Control of perchloroethylene exposure (PCE) in vapor degreasing operations, site #3.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974920

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	National Institute for Occupational Safety and Health (NIOSH). 2002. In-depth survey report: control of perchloroethylene (PCE) in vapor degreasing operations, site #1. EPHB 256-19b.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5071461

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	National Institute for Occupational Safety and Health (NIOSH). 2002. In-depth survey report: control of perchloroethylene (PCE) in vapor degreasing operations, site #4. EPHB 256-18b.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5071453

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cosgrove Health and Hygiene Inc.. 1994. Perchloroethylene Survey, Radiator Specialty Company. EPA-HQ-OPPT-2016-0732-0027.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5176394

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Aerosol Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	used NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for aerosol degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion of variability
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vulcan, Chemicals. 1992. INDUSTRIAL HYGIENE STUDY OF PERCHLOROETHYLENE/METHYLCHLOROFORM BLENDED AEROSOL BRAKE CLEANERS (FINAL REPORT) WITH COVER LETTER DATED 031292.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214357

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Aerosol Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	badge monitoring
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for aerosol degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability addressed through sampling different products with different concentrations of PERC
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vulcan, Chemicals. 1993. INDUSTRIAL HYGIENE STUDY OF METHYLENE CHLORIDE/PERCHLOROETHYLENE/ METHYLCHLOROFORM BLENDED AEROSOL BRAKE CLEANERS.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4213974

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Aerosol Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	badge monitoring
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for aerosol degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability addressed through sampling different products with different concentrations of PERC
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vulcan, Chemicals. 1994. INDUSTRIAL HYGIENE SIMULATIONS FOR AEROSOL BRAKE CLEANERS - POTENTIAL OCCUPATIONAL EXPOSURES TO PERCHLOROETHYLENE, WITH COVER LETTER DATED 05/04/94.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214374

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Aerosol Degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	badge monitoring
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for aerosol degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability addressed through sampling different products with different concentrations of PERC
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	National Institute for Occupational Safety and Health. 1995. In-depth survey report: control of perchloroethylene exposures in commercial dry cleaners at Brown's Cleaners, Sant Monica, California. ECTB 201-16a.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3797937

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, GE. 1999. Evaluation of Eight Dry Cleaning Shops with State-of-the-Art Control Equipment. Report on Task 1. Perchloroethylene in Dry Cleaning Shops.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099136

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, GE. 1999. In-depth survey report evaluation of control technology for perchlorethylene in dry cleaning shops. ECTB 240-11.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099138

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, GE. 1999. In-depth survey report evaluation of control technology for perchlorethylene in dry cleaning shops. ECTB 240-15.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099145

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, GE. 2000. In-depth survey report evaluation of control technology for perchlorethylene in dry cleaning shops. ECTB 240-12.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099134

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2000. In-depth survey report: Comparision of perchloroethylene exposures before and after the installation of local exhaust ventilation at a commercial dry cleaners at drycleaning plus.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3974932

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for 4th and 5th gen Dry cleaning machines
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burroughs, GE. 2000. In-depth survey report evaluation of control technology for perchlorethylene in dry cleaning shops. ECTB 240-12.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099147

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Coatings

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for coatings containing PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Stephenson, RL; Albrecht, WN. 1986. Health Hazard Evaluation Report No. HETA-85-482-86-116-1730, Winters Industry Foundry, Canton, Ohio. NIOSH/00166571.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2067795

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Coatings

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for coatings containing PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ford Motor, Co. 1981. Industrial hygiene survey - spray booths, oil house, roll weld, bonderite deck, trimline.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4213729

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Coatings

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	methodology not described
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for coatings containing PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sample type and exposure type givem, other metadata missing
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hervin, RL; Stroman, R; Belanger, P; Ruhe, R; Collins, C; Dyches, T. 1977. Health Hazard Evaluation Determination, Report No. HHE-77-63-449, McDonnell Aircraft Company, St. Louis, Missouri. NIOSH/00076128.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1878207

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Maskant

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for maskants containing PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1983. CHEMICAL EXPOSURE EVALUATION - TRICHLOROETHYLENE PRODUCTION PLANT (SANITIZED).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214220

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Processing Aid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for processing aids
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1983. 1982 INDUSTRIAL HYGIENE MONITORING - CHLOROPYRIDINES (SANITIZED).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214222

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Processing Aid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for processing aids
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chem, Co. 1982. CHLOR-PYRIDINES - 1981 INDUSTRIAL HYGIENE SURVEY (SANITIZED).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214219

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Processing Aid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for processing aids
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	Medium	× 1	2	Only ranges and averages given for 8-hr TWA results, discrete data available for short-term samples
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency and sample time not provided for 8-hr TWAs, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1979. Evaluation of work exposures in ag production and distribution department (apd2) operations, pittsburg, for 1978 with cover letter.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214166

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Processing Aid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methodology described, but no mention of OSHA or NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for processing aids
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gunter, BJ; Lybarger, JA. 1979. Health Hazard Evaluation Determination Report No. HHE-78-95-596, Jonas Brothers Taxidermy Co., Denver, Colorado. NIOSH/00091563.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1358123

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Wipe Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for wipe cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Moody, PL; Kramkowski, R; Keyserling, M. 1983. Health Hazard Evaulation Report HETA 81-409-1290: The Donaldson Company, Inc. HETA 81-409-1290.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099143

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Wipe Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for wipe cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burton, NC; Monestersky, J. 1996. Health hazard evaluation report No. HETA 96-0135-2612, Eagle Knitting Mills, Inc., Shawano, Wisconsin. HETA 96-0135-2612.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1320760

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Spot Cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for spotting at fabric finsihing facility
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Apol, A. G.. 1981. Health hazard evaluation report no. HETA 81-105-831, Labels West, Inc., Redmond, Washington.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970608

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Printing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Love, J. R.. 1982. Health hazard evaluation report no. HETA 81-310-1039, King-Smith Printing Company, Detroit, Michigan.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970585

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Printing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruhe, RL. 1983. Health Hazard Evaluation Report No. HETA-83-266-1391, McCourt Label Company, Bradford, Pennsylvania. NIOSH/00137711.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1619977

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Printing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency and sample time not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gunter, BJ; Thoburn, TW; London, M. 1984. Health Hazard Evaluation Report HETA 83-425-1500: Westview Press. HETA 83-425-1500.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5099142

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Printing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for printing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Vulcan, Chemicals. 1994. Task Report- Cold Cleaning Field Tests of Perchloroethylene /Alcohol Blends Vickers Electromechanical, Wichita, KS.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	4214376

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Cold cleaning

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	badge monitoring
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Data for cold cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data is older than 10 years but after PEL
	Metric 5:	Sample Size	High	× 1	1	discrete sample data given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Exposure frequency not provided, other metadata given
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	variability addressed through sampling different products with different concentrations of PERC
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	AC Products. 2020. Comments to draft risk evaluation for perchloroethylene from AC Products to US EPA (Docket No. EPA-HQ-OPPT-2019-0502).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983055

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Chemical Maskant
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Exhibit B - 0.656-1.05 ppm (PBZ), 0.748-360 ppm (area)Exhibit C - 1.4-71 ppm (PBZ), 170 ppm (area)Exhibit D - 7.5-11 ppm (PBZ)
Number of Samples:	Exhibit B - 4 PBZ, 4 areaExhibit C - 4 PBZ, 1 areaExhibit D - 2 PBZ
Number of Sites:	3
Type of Measurement or Method:	full-shift
Worker Activity:	Masker operators, scribes, maintenance
Number of Workers:	2-3 workers, 3-45 ONUs
Type of Sampling:	PBZ and area
PPE:	Exhibit B - General PPE requirements throughout the building include safety toed shoes and safety glasses. A hard hat is required in designated areas where an overhead hazard is present, for example, in the chem mill masking area. Workers in the chem mill scribing area use cut-resistant gloves because of the use of sharp cutting tools when cutting around parts after being dipped in perchloroethylene. Workers entering areas including the prep area, the cure room, and the dip tank booth are currently required to wear MSA fullface respirators with approved GME-P100 MSA filters for protection.Exhibit C - chemical resistant gloves, chemical protective coveralls, and a Honeywell 7700 series half-face APR w/ OVAG cartridgesExhibit D - half-face APR with OV cartridges
Analytic Method:	Exhibit B - NIOSH 1003Exhibit C - Passive OVM badesExhibit D - 3

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	Method is not specified for data collected at each site; one site indicated NIOSH method, one use passive badge sampling, and one did not specify the method

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Source Citation:	AC Products. 2020. Comments to draft risk evaluation for perchloroethylene from AC Products to US EPA (Docket No. EPA-HQ-OPPT-2019-0502).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983055

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are from the U.S.
	Metric 3:	Applicability	High	× 2	2	Data are for chemical maskant uses, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	× 2	2	Monitoring data were collected after the most recent PEL and no more than 10 years old (2015 or later).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All metadata provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability addressed by sampling multiple jobs at multiple sites. Where methodology is specified, uncertainty is addressed in the method; however, the methodology is not specified for all data and uncertainty is not further addressed.
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Spirit AeroSystems. 2020. Comments to draft risk evaluation for perchloroethylene from Spirit AeroSystems to US EPA (Docket No. EPA-HQ-OPPT-2019-0502).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983056

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Chemical Maskant
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	0.623-0.871 ppm (PBZ), 0.534-1.01 ppm (Area)
Number of Samples:	2 PBZ, 5 area
Number of Sites:	1
Type of Measurement or Method:	full-shift
Worker Activity:	Maskant operator and material hang/cut down
Number of Workers:	11-18 workers, 28-56 ONUs
Type of Sampling:	PBZ and area
PPE:	full face respirator w/OV/PlO0 filters, Tychem coveralls (for mats), Tyvek coveralls, hard hat, rubber boots, and nitrile gloves during the cleaning process.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Sampling/analytical methodology is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are from the U.S.
	Metric 3:	Applicability	High	× 2	2	Data are for chemical maskant uses, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	× 2	2	Monitoring data were collected after the most recent PEL and no more than 10 years old (from 2020).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All metadata provided

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Source Citation:	Spirit AeroSystems. 2020. Comments to draft risk evaluation for perchloroethylene from Spirit AeroSystems to US EPA (Docket No. EPA-HQ-OPPT-2019-0502).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983056

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Variability and uncertainty are not addressed.
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Moseley, CL; Mcconnell, R. 1985. Health Hazard Evaluation Report HETA-85-108-1593, Carey Plastics Division, Toledo Molding and Die Corp.,. HETA-85-108-1593.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6020027

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Mold Release
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	<1 ppm
Number of Samples:	7
Number of Sites:	1
Type of Measurement or Method:	full-shift
Worker Activity:	Press operators
Type of Sampling:	PBZ

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Not described, but NIOSH assumed to use NIOSH method
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are from the U.S.
	Metric 3:	Applicability	High	× 2	2	Data are for mold release uses, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Monitoring data were collected after the most recent PEL and greater than 10 years old.
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All metadata provided
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Variability and uncertainty are not addressed.

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Source Citation:	Moseley, CL; Mcconnell, R. 1985. Health Hazard Evaluation Report HETA-85-108-1593, Carey Plastics Division, Toledo Molding and Die Corp.,. HETA-85-108-1593.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6020027

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Halogenated Solvents Industry Alliance. 2020. NYSDEC dry cleaning data submitted by public comment from HSIA to US EPA (EPA-HQ-OPPT-2019-0502-0053).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983057

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Physical Form:	Liquid/vapor
Route of Exposure:	inhalation
Exposure Concentration (Unit):	<0.018-25.5 ppm
Number of Samples:	3740
Number of Sites:	1357

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are from the U.S.
	Metric 3:	Applicability	High	× 2	2	Data are for dry cleaning, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	× 2	2	Monitoring data were collected after the most recent PEL and no more than 10 years old (2013 or later).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Sample type and exposure type not provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Variability and uncertainty are not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.8.

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Source Citation:	Halogenated Solvents Industry Alliance. 2020. NYSDEC dry cleaning data submitted by public comment from HSIA to US EPA (EPA-HQ-OPPT-2019-0502-0053).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983057

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	OSHA. 2020. Chemical Exposure Health Data (CEHD).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983058

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Multiple
Route of Exposure:	inhalation
Exposure Concentration (Unit):	Provides personal breathing zone and area monitoring data for multiple COUs

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	OSHA and state inspectors are expected to use OSHA or NIOSH sampling methods. Samples sent to the OSHA SLTC are expected to be analyzed using OSHA or NIOSH analytical methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based exposure data
	Metric 3:	Applicability	Medium	× 2	4	The OSHA data include occupational scenarios within the scopes of the chemicals as identified by NAICS code and facility name. However, some occupational scenarios are not clear and cannot be clearly mapped to conditions of use within scope.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Datain the CEHD were collected after the most recent PEL but are generally greater than 10 years old
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	OSHA data include sample type and exposure type. Sample times also provided. Exposure frequency is inconsistently provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	OSHA data do not discuss variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

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Source Citation:	OSHA. 2020. Chemical Exposure Health Data (CEHD).
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6983058

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Facility

Source Citation:	Ipcs,. 1984. Tetrachloroethylene. Environmental Health Criteria.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	22606

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing, Import, processing and Use
Life Cycle Description (Subcategory of Use):	Manufacturing, Dry Cleaning, Metal Cleaning, textile finishing, Processing aid, Heat exchange fluid, intermediate for fluorocarbons
Process Description:	Manufacture: oxyhydrochlorination, perchlorination, and/or dehydrochlorination
Total Annual U.S. Volume (and percent of PV):	350 Kilotonnes
Possible Physical Form:	Liquid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	From trusted source (International Programme on Chemical Safety)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Includes information from US and OECD countries
	Metric 3:	Applicability	High	× 2	2	Covers uses both in and out of scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Study from over 20 years ago and includes uses no longer applicable
	Metric 5:	Sample Size	Low	× 1	3	Single data point, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Data sources and results generally described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2001. Sources, emission and exposure for trichloroethylene (TCE) and related chemicals.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	35002

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing, Import, processing and Use
Life Cycle Description (Subcategory of Use):	Manufacturing, Dry cleaning, vapor degreasing, cold cleaning, intermediate
Total Annual U.S. Volume (and percent of PV):	Data for several years, volumes given for most recent year: Manufactured: 1.23E11 g (1993)Import: 8.3E7 g (1986)Export: 9.84E9 g (1985) percent PV: 55 percent intermediate, 25 percent degreasing, 15 percent drycleaning, 5 percent unspecified
Chemical Concentration:	99-99.5 percent USP grade

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Prepared by EPA/ORD
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Over 10 years old but less than 20 years old
	Metric 5:	Sample Size	Low	× 1	3	Single data point, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1976. Criteria for a recommended standard occupational exposure to tetrachloroethylene (perchloroethylene).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	58207

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning, Degreasing, and other cleaning activities, other non-specified uses
Process Description:	Dry cleaning: hanging clothes, run-over cycle, filling mahcines
Total Annual U.S. Volume (and percent of PV):	734 million lbs in 1972
Number of Sites:	8

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH report
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data for various uses within scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ludwig, H. R.,Meister, M. V.,Roberts, D. R.,Cox, C.. 1983. Worker exposure to perchloroethylene in the commercial dry cleaning industry. American Industrial Hygiene Association Journal.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	58263

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Cycles/day, lb/wk of textiles processed, types of units used, description of dry cleaning process (transfer and dry-to-dry)
Total Annual U.S. Volume (and percent of PV):	700 million lbs; 50 percent for dry cleaning
Number of Sites:	25000 with 75 percent using PCE
Possible Physical Form:	Liquid/vapor

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Materna, B. L.. 1985. Occupational exposure to perchloroethylene in the dry cleaning industry. AIHA Journal.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	58325

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Describes cleaning, extracting and drying. Textiles added, agitated in the solvent, spun ro remove excess solvent, and tumble dried. Includes descriptions for both transfer and dry-to-dry. Includes descriptions for loading solvent into mahcines
Number of Sites:	17,390 commercial dry cleaners and 75 percent using PCE

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning (both transfer and dry-to-dry)
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago and includes some data for transfer machines which are no longer in use.
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.1	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Aggazzotti, G.,Fantuzzi, G.,Righi, E.,Predieri, G.,Gobba, F. M.,Paltrinieri, M.,Cavalleri, A.. 1994. Occupational and environmental exposure to perchloroethylene (PCE) in dry cleaners and their family members. Archives of Environmental and Occupational Health.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	74875

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Number of Sites:	Indicates used by 90 percent of dry cleaners

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Italy (OECD country
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 3.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Solet, D.,Robins, T. G.,Sampaio, C.. 1990. Perchloroethylene exposure assessment among dry cleaning workers. AIHA Journal.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	94476

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Total Annual U.S. Volume (and percent of PV):	53 percent in 1986
Number of Sites:	17,200, 85 percent use PCE

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines. More recent market data is available
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 3.0.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Blair, A.,Hartge, P.,Stewart, P. A.,McAdams, M.,Lubin, J.. 1998. Mortality and cancer incidence of aircraft maintenance workers exposed to trichloroethylene and other organic solvents and chemicals: Extended follow-up. Occupational and Environmental Medicine.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	194129

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Vapor Degreasing
Operating Days per Year and Batches per Day:	15 min/job and 4-15 jobs/day

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for degreasing
	Metric 4:	Temporal Representativeness	Low	× 2	6	Study from 20 years ago (1998)
	Metric 5:	Sample Size	Medium	× 1	2	Range of jobs/day given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Doherty, R. E.. 2000. A history of the production and use of carbon tetrachloride, tetrachloroethylene, trichloroethylene and 1,1,1-trichloroethane in the United States: Part 1"historical background; carbon tetrachloride and tetrachloroethylene. Environmental Forensics.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	194808

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing, Import, processing and Use
Life Cycle Description (Subcategory of Use):	Manufacture; Dry cleaning; Degreasing
Process Description:	Manufacture: Coproduct with TCE or CCl4, chlorination of ethylene, chlorinolysis of light hydrocarbons (or chlorinated derivatives), oxychlorination of ethlyeneDry Cleaning: Equipment recors 95-99 percent of PCE
Total Annual U.S. Volume (and percent of PV):	Intermediate: 25 percent of PV (1991)Dry Cleaning: 50 percent of PV (1991)Degreasing: 15 percent of PV (1991)
Number of Sites:	Mfg: 3 sitesDry Cleaning: 85-90 percent of 30,000 total US dry cleaners

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data covers several current uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Study from over 20 years ago, market data expected to be outdated; however, process description data may still be applicable
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

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Source Citation:	Doherty, R. E.. 2000. A history of the production and use of carbon tetrachloride, tetrachloroethylene, trichloroethylene and 1,1,1-trichloroethane in the United States: Part 1"historical background; carbon tetrachloride and tetrachloroethylene. Environmental Forensics.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	194808

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruder, A. M.,Ward, E. M.,Brown, D. P.. 1994. Cancer mortality in female and male dry-cleaning workers. Journal of Occupational Medicine.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	630933

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Textiles immersed in solvent, agitated, spun to extract solvent and tumble dried
Number of Sites:	90 percent of US Dry Cleaners

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	More recent market data available; however, process description may be useful
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Schreiber, J. S.,House, S.,Prohonic, E.,Smead, G.,Hudson, C.,Styk, M.,Lauber, J.. 1993. An investigation of indoor air contamination in residences above dry cleaners. Risk Analysis.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	630959

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Co-located Dry Cleaning
Process Description:	Provides number of machines in surveyed sites, machine capacities
Number of Sites:	43 percent of surveyed dry cleaners were co-located
Site Daily Throughput:	17 gal PCE/month

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for co-located dry cleaners
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Study from 20 years ago (1998)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Who,. 2006. Concise international chemical assessment document 68: Tetrachloroethene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	631155

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing, Import, processing and Use
Life Cycle Description (Subcategory of Use):	Manufacture/import, intermediate, dry cleaning, vapor degreasing, aerosol degreasing
Process Description:	Mfg: Oxychlorination, chlorination, and/or dehydrochlorination
Total Annual U.S. Volume (and percent of PV):	Mfg: 144,700Import: 16,300 tonnesIntermediate: 50 percent Dry Cleaning: 21-25 percent Vapor Degreasing: 10 percent Aerosol Degreasing: 10 percent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data covers several current uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Market data over 10 years old
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	von Grote, J.,Hürlimann, C.,Scheringer, M.,Hungerbühler, K.. 2006. Assessing occupational exposure to perchloroethylene in dry cleaning. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Facility; Published Models for Exposures or Releases;
Hero ID	632592

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Process diagrams for gen 2-5 machines, detailed description for each machine type
Batch Size:	<10-150 g solvent/kg textile, machines clean 12 kg (small) to 32 kg (large) per load, loading factore of .79
Operating Days per Year and Batches per Day:	Batch time is 40-70 min

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry surveys
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Germany (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from over 10 years ago (2006)
	Metric 5:	Sample Size	High	× 1	1	All data provided in ranges based on machine type and size
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Addresses variability between machine types and machine sizes
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Raisanen, J.,Niemela, R.,Rosenberg, C.. 2001. Tetrachloroethylene emissions and exposure in dry cleaning. Journal of the Air and Waste Management Association.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	671474

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Description of dry-to-dry and closed dry-to-dry machines
Batch Size:	12-60 kg textiles/load, 20-500 kg/day

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry surveys
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Finland (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from over 10 years ago (2001)
	Metric 5:	Sample Size	High	× 1	1	Full description of machine operating conditions provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Addresses variability between shop types
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Johansen, K.,Tinnerberg, H.,Lynge, E.. 2005. Use of history science methods in exposure assessment for occupational health studies. Occupational and Environmental Medicine.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	699212

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Brief descriptions of dry-to-dry and vented dry-to-dry, shop sizes from 40m3-300 m3, AER of 3-30 per hour
Site Daily Throughput:	4.6 tons/yr

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Some information referenced from Denmark government body
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Denmark (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago (study dated 2004; however, contents focused on data from 1987 and earlier)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Addressed variability betweem shop sizes and machine types
Overall Quality Determination†			Medium		1.9	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gulyas, H.,Hemmerling, L.. 1990. Tetrachloroethene air pollution originating from coin-operated dry cleaning establishments. Environmental Research.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	713690

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Type G machines are closed system with air circulation inside the machine

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	N/A		N/A	N/A - only qualitative information provided
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data from Germany (OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Study from 20 years ago (1990)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source 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 and Environmental Engineering.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	832709

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Hot/Cold Forming in Steel Plant
Process Description:	Cold forming: hot-rolled bands are pickled by HCl and then cold-rolled at room temperature to form thinner coilsHot-forming: Rectabular steel is rolled, milled, heated to 1200 oC, then rolled, leveled, and cooled

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	N/A		N/A	N/A - only qualitative information provided
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Data from China (non-OECD country)
	Metric 3:	Applicability	High	× 2	2	Data for cold/hot-forming (other use)
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1995. EPA office of compliance sector notebook project. Profile of the dry cleaning industry.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809362

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Process diagrams for gen 2-4 machines, detailed description for each machine type

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1995)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1985. Occupational exposure and environmental release assessment of tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Process Description:	process diagram and descriptions for chlorination of ethylene dichloride, hydrocarbon chlorinolysis, and oxychlorination of ethylene dichloride
Total Annual U.S. Volume (and percent of PV):	230,400 tons (1983)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	manufacturing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1985)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1991. Dry cleaning facilities - Draft background information for proposed standards.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970184

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	drescribes lifecycle of HAPs during dry cleaning and provides process diagrams
Total Annual U.S. Volume (and percent of PV):	2-14 kg HAP/100kg clothes cleaned
Number of Sites:	129
Possible Physical Form:	liquid to vapor

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NESHAP
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1991)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Lohman, J. H.. 2002. A history of dry cleaners and sources of solvent releases from dry cleaning equipment. Environmental Forensics.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3559217

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	A dry-to-dry system composed of a cabinet, a bag filter, and a still. The cabinet contains all of the compents, conatrols, and tanks necessary for washing, extracting, drying, and deodorizing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Trusted Source (AEHS)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Dry Cleaning Solvent
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2002)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides very high level description of use of PERC in the dry cleaning process, no quantitative data on production
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Garetano, G.,Gochfeld, M.. 2000. Factors influencing tetrachloroethylene concentrations in residences above dry-cleaning establishments. Archives of Environmental Health.
Type of Data Source	Facility; Monitoring Data;
Hero ID	630549

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Total Annual U.S. Volume (and percent of PV):	Tetrachloroethylene is used by approximately 85 percent of dry-cleaning facilities"
Number of Sites:	25,000 commercial drycleaners; 75 percent use tetrachloroethene as a solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	NIOSH Method 1003
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	New Jersey (Hudson Regional Health Commission)
	Metric 3:	Applicability	High	× 2	2	use data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2000).
	Metric 5:	Sample Size	Medium	× 1	2	distribution of samples adaquately characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Detailed analysis of residences characteristics and monitoring results
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion of the variability
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Process Description:	manufactured by three processes: thermal chlorination of one to three carbon alkanes, catalytic chlorination of ethylene dichloride, and chlorination of acetylene
Total Annual U.S. Volume (and percent of PV):	In 1978, 329,000 MT produced; after imports (17,000 MT) and exports (29,000 MT) about 317,000 MT remained in the US for the following major industrial uses: (1) Textile cleaning 68 percent , Metal cleaning 17 percent , fluorocarbon production 12 percent , Other 2 percent .
Number of Sites:	11Site locations and individual capacities are listed in table 3 (pg 30 of 152).Table A-1 (page 144 of 152) has estimated counts for facilities for using tetrachloroethylene.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	metal degreasing
Process Description:	The extent of use of PCE in metal cleaning is small as compared with the use of trichloroethylene. The higher boiling point of tetrachloroethylene(121C versus 87C) requires the use of substantially more heating for vapor degreasing than is needed with trichloroethylene. The resultant hotter vapor may be desirable for selected applications (e.g., dewaxing) but is generally undesirable as the cleaned material has to be removed at a higher temperature. Tetrachloroethylene is also utilized to a limited extent as a cold cleaning solvent.
Number of Sites:	24,000 vapor degreasing and about 900,000 cold cleaning facilities may use (e.g., gas stations, machinery manufacturers). DOW reported 2,188 metal working plants use tetrachloroethylene for vapor degreasing and cold cleaning.
Possible Physical Form:	Cleaning grades of the chemical contain from 0.01 percent to 0.1 percent by weight of stabilizers; industrial grades contain up to about 0.35 weight percent . The following chemicals may be used (in various combinations)as stabilizers: (1) Amines (e.g., allyl amines), (2) Methylmorpholine, (3) Epichlorohydrin, (4) Epibromohydrin, (5) N-methylpyrrole, (6) Allyl glycidyl ether.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Tetrachloroethylene is used in drycleaning at approximately 35,000 facilities throughout the United States (NIOSH, 1979). Most of these tetrachlorethylene users are small, independent retail drycleaners. Most retail (commercial) drycleaning is done with equipment that requires the manual transfer of garments damp with solvent. In the textile industry, PCE is used in wool scouring and dye scouring of knits, as well as in laboratory-scale simulation of drycleaning operations for testing of fabric wear characteristics.
Number of Sites:	35000

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1982)
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.

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Source Citation:	Gilbert, D.,Goyer, M.,Lyman, W.,Magil, G.,Walker, P.,Wallace, D.,Wechsler, A.,Yee, J.. 1982. An exposure and risk assessment for tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	732615

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Risk assessment for the halogenated solvent cleaning source category.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3044969

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	degreasing
Total Annual U.S. Volume (and percent of PV):	From 1998 to 2003, the demand for tetrachloroethylene... for degreasing decreased by 39 percent....
Number of Sites:	218

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	use data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2005).
	Metric 5:	Sample Size	Medium	× 1	2	Not addressed.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	usage trends and facility counts are available, but no other metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chemical, Co. 2008. Product safety assessment: Perchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3797950

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Process Description:	* primary solvent used in commercial and industrial dry cleaning. * chemical intermediate in the production of several fluorinated compounds, * surface preparation and cleaning solvent, and * oil refineries for catalyst regeneration.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The Dow Chemical Company
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Global
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Single sample; MSDS like data from a single manufacture
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Data sources are generally described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Variability discussed in the context of PERC uses and historical production.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dow Chemical, Co. 2008. Product safety assessment: Perchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3797950

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	* primary solvent in commercial and industrial dry cleaning.* chemical intermediate in production of some fluorinated compounds.* raw material in manufacture of HFC 134a and 125.* used to produce CFC-113 (feedstock for fluoropolymers)
Process Description:	Dow produces perchloroethylene by a direct chlorination ("Per Tet" or perchlorination) process. The perchlorination process involves the reaction of chlorine with ethylene dichloride (EDC) and various C1-C3 chlorocarbons to produce perchloroethylene and the co-product carbon tetrachloride... markets this material in several grades, including products under the trade names DOWPERTM solvent and ISOFORM" perchloroethylene.
Total Annual U.S. Volume (and percent of PV):	US demand in 2014, is 355 million pounds.Europe usage in 2015 is 123 million pounds.
Number of Sites:	Dow produces PCE in the US, Brazil and Germany.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The Dow Chemical Company
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Global
	Metric 3:	Applicability	High	× 2	2	use and manufacturing data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Single sample; MSDS like data from a single manufacture
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Data sources are generally described
Domain 4: Variability and Uncertainty						

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Source Citation:	Dow Chemical, Co. 2008. Product safety assessment: Perchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3797950

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Variability discussed in the context of PERC uses and historical production.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Finkbeiner,,Hoffmann,,Kreisel,. 1997. ENVIRONMENTAL AUDITING: The Functional Unit in the Life Cycle Inventory Analysis of Degreasing Processes in the Metal-Processing Industry. Environmental Management.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1630576

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Process Description:	Provides a process tree for metal degreasing and discussion of a life cycle assessment of the three main degreasing processes.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Data source not specified
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Germany
	Metric 3:	Applicability	High	× 2	2	degreasing
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years (1997)
	Metric 5:	Sample Size	Medium	× 1	2	data provided in ranges with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	some discussion of uncertainty and variability
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tsai, W. enT. 2012. An Analysis of Reducing Perchloroethylene Emissions in the Urban Environment: A Case Study of Taiwan. CLEAN - Soil, Air, Water.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2680837

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Process Description:	Commercial dry cleaning operations
Total Annual U.S. Volume (and percent of PV):	Taiwan PCE demand 616 MT in 1998300 MT in 1999-2009 (Figure givies annual numbers)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	data obtained from Annual Statistics of Directorate General of Customs for Taiwan
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Taiwan
	Metric 3:	Applicability	Medium	× 2	4	usage rates outside of US
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources named, but accuracy unknown
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.0	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McCulloch, A.,Midgley, P. M.. 1996. The production and global distribution of emissions of trichloroethene, tetrachloroethene and dichloromethane over the period 1988"1992. Atmospheric Environment.
Type of Data Source	Facility; Environmental Release Data;
Hero ID	3026800

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Total Annual U.S. Volume (and percent of PV):	50,000 tons/yr from OECD territories

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Independent auditor
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	OECD territories
	Metric 3:	Applicability	Medium	× 2	4	production numbers include non-US countries
	Metric 4:	Temporal Representativeness	Low	× 2	6	1996
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources named, but accuracy unknown
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Newmoa,. 2001. Pollution prevention technology profile - Closed loop vapor degreasing.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3044986

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Degreasing
Process Description:	Closed-Loop Vapor Degreaser schematic included. Vacuum vapor degreaser system and Airless Vacuum Vapor Degreasers also described.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Northwest Waste Mgmt Official Association
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	US technology
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2001
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	data sources named, but accuracy unknown
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kim, NK. 2005. [Cover letter addressed to Robert E. McGaughy regarding NYSDOH studies addressing the neurotoxicity of perchloroethylene]. Personal Communication.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	633587

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Total Annual U.S. Volume (and percent of PV):	148 million kg/yr in 2000

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Literature review
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	US technology and studies
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1920s-early 2000s
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	clearly documented
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2014. Toxicological profile for tetrachloroethylene (Draft for public comment).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2990770

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture/import
Life Cycle Description (Subcategory of Use):	Manufacture for dry cleaning, textile-processing solvent, vapor degreasing
Process Description:	The majority of tetrachloroethylene produced in the United States is made by one of threeprocesses: direct chlorination of certain hydrocarbons, chlorination of ethylene dichloride, andoxychlorination. Processes described.
Total Annual U.S. Volume (and percent of PV):	458 million pounds produced by U.S. manufacturers in 2011, 26.5 million pounts imported in 2012,83.8 million pounts exported in 2012
Number of Sites:	3 U.S. manufacturers
Possible Physical Form:	volatile liquid

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Atsdr,. 2014. Toxicological profile for tetrachloroethylene (Draft for public comment).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2990770

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning,vapor and liquid degreasing agent
Number of Sites:	28000 dry cleaners as of 2013

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Snedecor, G.,Hickman, J. C.,Mertens, J. A.. 2004. Chloroethylenes and chloroethanes.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3859422

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture - Trichloroethylene
Life Cycle Description (Subcategory of Use):	Manufacture
Process Description:	Most trichloroethylene is made from ethylene, 1,2-dichloroethane or ethylene dichloride
Total Annual U.S. Volume (and percent of PV):	150,000 ton/yr in 2002
Number of Sites:	2

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	John Wiley & Sons textbook
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004 textbook
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Snedecor, G.,Hickman, J. C.,Mertens, J. A.. 2004. Chloroethylenes and chloroethanes.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3859422

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture - Tetrachloroethylene
Life Cycle Description (Subcategory of Use):	Manufacture
Process Description:	Production described using noncatalytic chlorination of ethylene dichloride (or other 2-carbon chlorinated hydrocarbon). With or without catalyst at high temps. Also production by reaction of EDC with chlorine or HCl and Oxygen in the presence of a catalyst.
Total Annual U.S. Volume (and percent of PV):	195,000 ton/yr in 2002
Number of Sites:	3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	John Wiley & Sons textbook
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	High	× 2	2	Data includes in-scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004 textbook
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1980. Waste solvent reclamation.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3840001

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling for industrial reuse
Life Cycle Description (Subcategory of Use):	Disposal
Process Description:	General reclamation scheme for solvent reuse is illustrated in figure 4.7.1 of the document with full description of the process.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	References include EPA and industry sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Medium	× 2	4	Data includes reclamation from in-scope uses
	Metric 4:	Temporal Representativeness	Low	× 2	6	References from the 1960s and 1970s
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Whittaker, S. G.,Johanson, C. A.. 2013. A health and environmental profile of the dry cleaning industry in King County, Washington. Journal of Environmental Health.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3489425

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	After thewash cycle, dry cleaning solvent is typically distilled and filtered for reuse within themachine. This closed loop process generatesstill bottoms (also called "sludge"), separatorwater (from the physical separation ofdry cleaning solvent and water in a waterseparator), and used filters. These wastesmay be contaminated with dry cleaning solvent,spot cleaning chemicals, and residualsolvent remaining in the fabrics from previouscleanings. Unless chemical characterizationdetermines that these wastes containcontaminant levels below those specified inWashington State"s Dangerous Waste Regulations(Washington State Department ofEcology, 2009), they are considered hazardousand must be periodically collected anddisposed of by licensed haulers. Handlingthese waste streams also provides opportunitiesfor worker exposure and environmentalrelease.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	State, federal and academic sources referenced
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Washington state
	Metric 3:	Applicability	Medium	× 2	4	Life cycle description of in-scope use
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	Metric 5:	Sample Size	High	× 1	1	Detailed number of facilities contacted
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						

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Source Citation:	Whittaker, S. G.,Johanson, C. A.. 2013. A health and environmental profile of the dry cleaning industry in King County, Washington. Journal of Environmental Health.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3489425

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	Includes some uncertainty discussions where appropriate
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1982. Guideline series: Control of volatile organic compound emissions from large petroleum dry cleaners.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860357

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Petroleum based dry clening; uses entirely different process than perc
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	Most data diven as single data point with uncertain representativeness, some data given as ranges
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1982. Guidelines series: Control of volatile organic compound emissions from large petroleum dry cleaners.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970127

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Petroleum based dry clening; uses entirely different process than perc
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	Most data diven as single data point with uncertain representativeness, some data given as ranges
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.6.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Dry cleaners use PCE in a dry cleaning machine to clean all types of garments including clothes, gloves, leather garments, blankets, and absorbent materials.
Total Annual U.S. Volume (and percent of PV):	The 1993 dry cleaning NESHAP defines this as facilities that purchase more than 2,100 gallons of PCE per year (1,800 gallons per year if the facility uses transfer machines). The 15 major sources use approximately 2 percent of the total PCE used in the dry cleaning industry. Area sources are typically the common neighborhood commercial dry cleaner. Area sources were divided into large or small in the 1993 NESHAP, with large area sources defined as those facilities that use between 140 to 2,100 gallons of PCE per year (or 140 to 1,800 gallons per year if the facility uses transfer machines). Small area sources use less than 140 gallons per year.
Number of Sites:	There are approximately 28,000 PCE dry cleaning facilities in the United States. Of the 28,000 dry cleaners, 15 of the facilities are major sources [for HAP emissions], and the remaining are area sources.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	site counts and general usage information
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2006)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Plastic and rubber products
Process Description:	Plastics materials are polymers which have been modified in some way, such as the addition of additives and processing under pressure and/or heat. They are then ready to be converted into plastics artifacts.Figure 2.1 Manufacturing stages of the plastics industry (pg 19 of 141)Additives used as processing aids include: "blowing agents" plastics materials are often used in a cellular form. The cells may be formed either by direct gassing or, more commonly, by the use of chemicals or solvents which release copious quantities of gas on heating; and "viscosity aids" materials which are used to regulate the viscosity of PVC- plasticiser solvent mixtures during processing, they are themselves polymers (pg 24 of 141).Coupling agents act at the interface between filler and plastic... Coupling agents are characteristically low viscosity liquids, or capable of becoming such by melting or dissolution in a suitable solvent (pg 79 of 141).
Total Annual U.S. Volume (and percent of PV):	3,500,000 tonnesTable 2.2 Plastics consumption by end use sector (pg 22 of 141)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Organisation for Economic Co-operation and Development (OECD)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK
	Metric 3:	Applicability	Medium	× 2	4	general data not chemical-specificgeneral details on plastic additives
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2009)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Other chemical products and preparations
Process Description:	Polymers are the virgin products of the chemical/petrochemical industry and have undergone no significant post-reactor treatments... this group includes those polymers which may have been modified within the reactor as part of a subsequent chemical processPolymers fall into two categories defined by their chemical structure: (1) Thermoplastic polymers, (2) Thermosetting resins
Total Annual U.S. Volume (and percent of PV):	Table 4.1 Estimates of UK consumption of polymers (1994) together with breakdown by conversion processes tonnes (pg 39 of 141)Table 4.2 Polymer consumption by end use (pg 40 of 141).Table 5.2 Polymer usage (by process type) in the UK and estimate usage on a site (Qpolymer) by Method 1 (pg 46 of 141)
Number of Sites:	There are some 20 chemical and petrochemical companies manufacturing polymers in the United Kingdom. These include UK based multinational operations, such as ICI and BP Chemicals, manufacturing sites of overseas multinational companies, such as Elf Atochem and Dow, as well as smaller national companiesTable 5.1 Distribution by size of plastics processing operations (pg 45 of 141)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Organisation for Economic Co-operation and Development (OECD)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK
	Metric 3:	Applicability	Medium	× 2	4	general data not chemical-specificgeneral details on additives
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2009)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Other chemical products and preparations
Process Description:	Compounding involves the blending into the polymers of various types of additives, including fillers, reinforcements and colours to meet the requirements of specific applications for plastics materials. There are companies which specialise in this field, but many polymer makers and converters also undertake this work.++++++++++++++++Conversion of compounds into finished artefacts is carried out using a diversity of processes. In the case of thermoplastics, the materials are shaped by heat and pressure using moulding, extrusion and other processes. Thermosetting resins are similarly cured under heat and pressure, although some resins are capable of being cured at ambient temperatures. Thermosetting processes are irreversible.
Number of Sites:	Some 50 UK companies specialise in the compounding of plastics and it is estimated that there are over 3,000 companies carrying out plastics conversion. Many of these companies are very small and there is little information on the precise structure of the industry. There are few industrial estates or regions within the UK, or indeed in most industrialised countries, which do not have one or more companies manufacturing plastics.Table 2.1 Structure of the industry by processing activity (pg 21 of 141)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Organisation for Economic Co-operation and Development (OECD)
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	UK
Metric 3:	Applicability	Medium	× 2	4	general data not chemical-specificgeneral details on additives
Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2009)
Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ma, Turi. 2017. Massachusetts chemical fact sheet: Perchloroethylene (PCE).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986888

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Number of Sites:	Dow Chemical, PPG Industries, and Vulcan Materials Company are the only U.S.-based manufacturers of PCE.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	The Toxics Use Reduction Institue" established by the Massachusetts ToxicUse Reduction Act of 1989
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	For an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1996)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	states all data sources
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ma, Turi. 2017. Massachusetts chemical fact sheet: Perchloroethylene (PCE).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986888

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer useProcessing
Life Cycle Description (Subcategory of Use):	Cleaners and degreasers (other); Dry cleaning solvent; Automotive care products (e.g., engine degreaser and brake cleaner)Intermediate in industrial gas manufacturing
Process Description:	National PCE use falls into four main use categories: 1) dry cleaning and textile processing (37 percent), 2) intermediate chemical use (37 percent) in the manufacture of hydrogen-based fluorocarbons (HFCs and HCFCs), 3) metal cleaning (15 percent), and 4) other uses, including auto brake cleaners, suede protectors, water repellents, and silicone lubricants (12 percent).
Total Annual U.S. Volume (and percent of PV):	In 1996, these end uses consumed 300 million pounds of PCE in the U.S... In 1996, Massachusetts" facilities used 506,000 pounds of PCE (see Table 1).++++++++++++++++PCE use in Massachusetts declined dramatically between 1990 and 1996 as businesses adopted safer substitutes.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	The Toxics Use Reduction Institue" established by the Massachusetts ToxicUse Reduction Act of 1989
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Regional (Massachusetts) and US usage and production data
	Metric 3:	Applicability	Medium	× 2	4	For an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1996)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	states all data sources
Domain 4: Variability and Uncertainty						

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Source Citation:	Ma, Turi. 2017. Massachusetts chemical fact sheet: Perchloroethylene (PCE).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986888

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986890

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Includes a collection of process flow diagrams and a description of activities (e.g., dry-to-dry machines with a refrigerated condenser, dry cleaning pressing operation); begins on page 52 of 86.
Batch Size:	Dry cleaners are classified as small area, large area, or major based on the yearly amount of PERC purchased on a rolling average. Table II-2 located on page II-7 has a chart you can use to determine your classification" If a facility purchases more than 1,470 gallons of PERC in a one-year period of time, they will be required to apply for a Title V operating permit (page 63 of 86).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	New Mexico Environment Departemnt
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	useful details on facility classification relative to consumption
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions and data soucres are clearly stated (e.g., NESHAP, RCRA)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

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Source Citation:	Nmed,. 2017. Dry cleaning: Guidance for improved environmental performance and pollution prevention in your dry cleaning business.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986890

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kirk, Othmer. 2004. Kirk-Othmer Encyclopedia of Chemical TechnologyChlorocarbons and chlorohydrocarbons.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3994180

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	An oxychlorination process has been used quite successfully to coproduce trichloroethylene and perchloroethylene". Recent advances in oxychlorination to produce trichloroethylene and perchloroethylene have demonstrated enhancements in the yield to trichloroethylene. The use of by-products of the manufacture of allyl chloride has also been studied for conversion to trichloroethylene and perchloroethylene in an oxychlorination process. In a typical operation, 1,2-dichloroethane, hydrogen chloride or chlorine, and oxygen are fed to fluidized bed reactor at 400"C to produce trichloroethylene and perchloroethylene... ++++++++++Trichloroethylene is also produced via a thermal chlorination process
Total Annual U.S. Volume (and percent of PV):	Demand in the US, Western Europe, and Japan for the products l,l,l"trichloroethane, trichloroethylene, and perchloroethylene has been driven strongly by legislative initiatives to reduce levels of emissions to the atmosphere (Table 5). [the table includes consumption figures for 1987 through 2000]++++++++++Perchloroethylene demand dropped sharply in the early 1990s due to stricter regulation of emissions from the dry cleaning indutry. Also, perchloroethylene demand was reduced because it was used as a precursor for many chlorofluorocarbons that were eliminated in the 1990s. Demand has increased slightly in the late 1990s due to the increase in demand for hydrofluorocarbons, some of which can be produced from perchloroethylene.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Kirk Othmer
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US

Continued on next page

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Source Citation:	Kirk, Othmer. 2004. Kirk-Othmer Encyclopedia of Chemical TechnologyChlorocarbons and chlorohydrocarbons.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3994180

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 3:	Applicability	High	× 2	2	In scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (published in 2004; data from 2000)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kirk, Othmer. 2004. Kirk-Othmer Encyclopedia of Chemical TechnologyChlorocarbons and chlorohydrocarbons.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3994180

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents (for cleaning or degreasing)
Process Description:	Trichloroethylene and perchloroethylene are both used as vapor degreasers and in the manufacture of hydrofluorocarbon-134a (HFC-134a). Perchloroethylene is an intermediate for many other CFC, HCFC and HFC products. It is also used extensively as a dry cleaning solvent.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Kirk Othmer
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	In scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (published in 2004; data from 2000)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	data sources are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. All about "PER" " in a nutshell.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982136

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	Use in modern dry cleaning machines in Europe
Chemical Concentration:	<10g/kg garment

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	ECSA European overview of dry cleaning industry
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	EU
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2010. Freasibility advisory committee - Trichloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982143

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Batch vapor degreaser, In-line vapor degreaser
Number of Sites:	1094 in 2006

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry association
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for vapor degreasing
	Metric 4:	Temporal Representativeness	High	× 2	2	2006
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2011. Health profile on perchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982134

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	Use in modern dry cleaning machines in Europe
Total Annual U.S. Volume (and percent of PV):	44000 tonnes in 2010 in 27 EU countries and Norway, Switzerland and Turkey.
Number of Sites:	3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry association
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	EU countries
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2011
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2016. Guidance on storage and handling of chlorinated solvents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982131

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	Surface and dry cleaning schematics and key characteristics listed in Table 1 and Table 2

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry association
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	EU countries
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.,I. C. F. Consulting. 2004. The U.S. solvent cleaning industry and the transition to non ozone depleting substances.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982140

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Process Description:	Solvent cleaning process and equipment described in box 1-1 on page 9.
Total Annual U.S. Volume (and percent of PV):	Carbon Tetrachloride usage in 1993 shown as 0.04 million pounds. 0 lbs in 1994 and 1995.HSIA estimates metal cleaning and automotive aerosols consumed 34.4 million lbs of Perchloroethylene, which is 10 percent of the annual use.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Medium	× 2	4	Data for solvents and degreasers, though not all perc
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004 report, but data from the 1990s.
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cis,. 1997. Clearing the air on clean air: Strategies for perc dry cleaners compliance, risk reduction, pollution prevention.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982315

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	Dry cleaning diagram of potential waste losses shown in figure 2.Dry-to-dry main assembly shown in Figure 7 and 8.
Total Annual U.S. Volume (and percent of PV):	191.8 million lbs in 1991

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	1997
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ecb,. 2005. European Union risk assessment report: Tetrachloroethylene. Part 1 - Environment.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3839195

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture - tetrachloroethylene
Life Cycle Description (Subcategory of Use):	Domestic Manufacture (Europe)
Process Description:	Tetrachloroethylene may be produced by oxychlorination, chlorination and/ ordehydrochlorination reactions of hydrocarbons or chlorinated hydrocarbons. The mostcommon methods of production reported are the chlorination of propylene and the oxychlorination of 1,2-dichloroethane.
Total Annual U.S. Volume (and percent of PV):	164,000 tonnes/yr in 1994.
Number of Sites:	6

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	European Chemicals Bureau
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2005
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness cannot be determined
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Includes most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ecb,. 2005. European Union risk assessment report: Tetrachloroethylene. Part 1 - Environment.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3839195

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasers
Number of Sites:	60,000

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	European Chemicals Bureau
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	2005
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness cannot be determined
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Includes most metadata
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	1994. National emission standards for hazardous air pollutants: Halogenated solvent cleaning – Background information for final standards.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860538

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	degreasing

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	High	× 2	2	Solvent cleaning
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	Most data diven as single data point with uncertain representativeness, some data given as ranges
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	In 1985, the EPA estimated that California's one perchloroethylene production facility had the capacity to produce an estimated 25,000 tons of the solvent annually (SRI International, 1990; U. S. EPA, 1985).
Number of Sites:	1 in California

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	Based on the staff's survey, an estimated 19,000 tons of perchloroethylene were used in California in the following processes and products: dry cleaning, degreasing, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, and laboratory solvents.The direct uses section of Table III-1 shows that dry cleaning and degreasing operations consumed about 80 percent of the total perchloroethylene used in the state (ARB, 1989a)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment); Batch vapor degreaser (e.g., open-top, closed-loop); In-line vapor degreaser (e.g., conveyorized, web cleaner)
Process Description:	Degreasing is an integral part of many manufacturing industries including the following: automobile, electronic, furniture, appliance, textile, paper, plastic, and glass.++++++++++In the degreasing process, the part to be cleaned is placed in a degreasing tank or chamber and exposed to a liquid or vaporized solvent. In cold cleaners, dirty parts are manually sprayed clean and are then soaked in a tub. Open-top vapor degreasers clean as hot solvent vapor condenses on colder metal parts. Continuously-loaded conveyor degreasers use cold or vaporized solvent and are usually hooded or enclosed. After cleaning, the parts are either suspended over the tank to drain or placed on an external rack that directs solvent back into the tank (U. S. EPA, 1977; U. S. EPA. 1985).
Total Annual U.S. Volume (and percent of PV):	Based on the EPA estimate, the use of 3,300 tons of perchloroethylene by degreasers in California in 1987 resulted in estimated emissions of about 3,000 tons (ARB, 1989a; U. S. EPA. 1985).
Number of Sites:	PEI Associates estimate that there are several thousand cold cleaning, open-top vapor, and conveyor type degreasing units in operation in California (PEI. 1986). Many of these degreasing units are expected to use perchloroethylene as the solvent.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.

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Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Paint and coating products
Total Annual U.S. Volume (and percent of PV):	Based on a survey of halogenated solvent distributors. Approximately 1,300 tons of perchloroethylene were used by California's manufacturers of paints and architectural coatings in 1987.++++++++++Approximately 960 tons were used in the manufacture of the following products: aerosols (spray paints and cleaners), pharmaceuticals, textiles, printing inks, and dielectric fluid for power transformers.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Adhesive and sealant products
Total Annual U.S. Volume (and percent of PV):	Based on a survey of halogenated solvent distributors, approximately 340 tons of perchloroethylene were used by California's adhesives manufacturers in 1987.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part A: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling
Life Cycle Description (Subcategory of Use):	Recycling
Total Annual U.S. Volume (and percent of PV):	An estimated 1,900 tons of perchloroethylene were sent to approximately 20 solvent reclaimers in California in 1985. This estimate is based on the 9,685 tons of halogenated solvent reported on hazardous waste manifests sent to recyclers and the estimated 20 percent of perchloroethylene contained in the halogenated solvents (CDHS, 1984; Schneider, 1986b).
Number of Sites:	20 solvent reclaimers in California in 1985.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carb,. 1991. Technical support document part B: Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986481

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	The NIOSH reported that, although 75 percent of dry-cleaning establishments in the U.S. use PCE, Oklahoma may be unique in that petroleum solvents account for more than 50 percent of total solvents used (NIOSH, 1980).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario is within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer useProcessing
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent; Metal (e.g., stainless steel) and stone polishes; Cleaners and degreasers (other); Automotive care products (e.g., engine degreaser and brake cleaner)Intermediate in industrial gas manufacturing
Process Description:	In the 1970s, domestic use patterns were as follows: 58 percent for drycleaning and textile processing, 18 percent for metal cleaning, 12 percent for chemical intermediates, and 12 percent for all other uses (IARC 1995). During the 1990s, tetrachlorethylene use in the drycleaning industry declined in order to meet stringent government regulations for workplace exposure. By 2002, uses were 15 percent for drycleaning, 10 percent for metal cleaning, 65 percent for chemical intermediates, and 10 percent for other uses (CMR 2002).++++++++++++++++Tetrachloroethylene also has been used as an insulating fluid and cooling gas in electrical transformers; in paint removers, printing inks, adhesive formulations, paper coatings, and leather treatments; in aerosol formulations, such as water repellents, automotive cleaners, silicone lubricants, and spot removers; as an extractant for pharmaceuticals; to remove soot from industrial boilers; and as an antihelminthic agent (IARC 1995).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US National Toxicology Program, Department of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US and worldwide
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2002)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	In 2002, the combined production capacity of the three U.S. manufacturers of tetrachloroethylene was 430 million pounds (CMR 2002).
Number of Sites:	US manufacturers=3US suppliers=43(also includes worldwide totals)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US National Toxicology Program, Department of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US and worldwide
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2002)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nih,. 2016. Report on carcinogens: Tetrachlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982331

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Import
Total Annual U.S. Volume (and percent of PV):	In 2008, imports were 36.2 million pounds.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US National Toxicology Program, Department of Health and Human Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US and worldwide
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	The release data study does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	Tetrachloroethylene is produced by oxychlorination, chlorination and/or dehydrochlorination reactions of hydrocarbons or chlorinated hydrocarbons in closed systems. The most common methods are chlorination of propylene and oxychlorination of 1,2-dichlorethane.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2003)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ec,. 2009. Recommendation of the scientific committee on occupational exposure limits for tetrachloroethylene (perchloroethylene).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982359

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	The EU RAR indicates that about 164,000 tonnes were produced in the EU in 1994, although Eurochlor"s estimate of sales of tetrachloroethylene was only about 100,000 tonnes during the early 1990s, falling to about 80,000 tonnes in 2004.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Nordic Expert Group and Dutch Expert Committee on Occupational Standards
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data are from OECD countries and the US.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2003)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	California Air Resources Board. 1991. Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	192269

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Number of Sites:	Until recently, the state had one perchloroethylene production facility with an estimated production capacity of 25,000 tons per year...As of 1991 Perchloroethylene is no longer produced in California.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	California Air Resources Board. 1991. Proposed identification of perchloroethylene as a toxic air contaminant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	192269

EXTRACTION

Parameter	Data
Life Cycle Stage:	Distribution in commerce
Life Cycle Description (Subcategory of Use):	Distribution
Total Annual U.S. Volume (and percent of PV):	Based on a survey of California halogenated solvent distributors, approximately 19,000 tons of perchloroethylene per year are used in the following: dry cleaning, decreasing, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, laboratory solvents, and other miscellaneous uses.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Air Resources Board
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2017. ECSA product and application toolbox: Guidance on safe and sustainable use of chlorinated solvents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982127

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	-
Life Cycle Description (Subcategory of Use):	-

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ESCA
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	EU (OECD)
	Metric 3:	Applicability	Unacceptable	× 2	8	This is simply the launch page for the European Chlorinated Solvent Association (ECSA) online toolbox which provide users of chlorinated solvents information about safe & sustainable product use. No applicable information
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Cleaners and degreasers (other)
Total Annual U.S. Volume (and percent of PV):	PERC demand has remained steady or increased in recent years as a result of their use as raw materials in the production of refrigerant alternatives to CFCs" The producers of these solvents remain committed to serving their markets for many years to come.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Batch vapor degreaser (e.g., open-top, closed-loop)
Process Description:	The traditional batch degreaser is a covered tank, with cooling coils at the top, into which the dirty parts are lowered. Solvent in the bottom of the tank is heated to produce vapor. On contacting the cooler work, the vapor condenses into pure liquid solvent.++++++++++++++PERC"s high boiling point gives it a clear advantage in removing waxes and resins that must be melted in order to be solubilized. The higher temperature also means that more vapors will be condensed on the work than with other solvents, thus washing the work with a larger volume of solvent.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

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Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982144

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2008. Chlorinated solvents - The key to surface cleaning performance.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982144

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	In-line vapor degreaser (e.g., conveyorized, web cleaner)
Process Description:	Several types of conveyorized equipment provide inline vapor degreasing. These large, automatic units, which can handle a volume of work and are enclosed to provide minimal solvent loss, include the monorail and the cross-rod degreasers. They are particularly valuable when production rates are high

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2007. Occupational health hazard risk assessment project for California: Identification of chemicals of concern, possible risk assessment methods, and examples of health protective occupational air concentrations.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982225

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	Production/Import Volume: >100M- 500M (Range in Pounds); from TSCA, 2002.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2002)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	Total production of PCE in the United States has been decreasing over the last decade. In 1983, production of PCE was 547 million pounds while the production decreased to 271 million pounds in 1993 (ATSDR, 1997).
Number of Sites:	According to the U.S. EPA"s 1992 Toxic Release Inventory, 68 facilities in California manufacture or process PCE, with total maximum on-site amounts ranging from 0 to 10 million pounds (ATSDR, 1997).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EXTRACTION

Parameter	Data
Life Cycle Stage:	A) Commercial/consumer useB) Processing
Life Cycle Description (Subcategory of Use):	A) Dry cleaning solvent; Cleaners and degreasers (other)B) Intermediate in basic organic chemical manufacturing; Recycling
Total Annual U.S. Volume (and percent of PV):	The primary uses of PCE are as a chemical intermediate, primarily in the production of chlorofluorocarbons, and as a solvent, primarily for cleaning operations. The breakdown of the use of PCE is approximately 55 percent as a chemical intermediate, 25 percent in metal cleaning and vapor degreasing, 15 percent in dry-cleaning operations, and 5 percent for miscellaneous other uses (ATSDR, 1997)...Solvent recovery operations and recycling have also reduced demand for PCE production.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	California Environmental Protection Agency - Office of Environmental Health Hazard Assessment
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US, but some totals are regional.
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Oehha,. 2001. Public health goal for tetrachloroethylene in drinking water.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982310

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	A chemical industry survey reports that in the past 10 years, drycleaners have reduced their use of perc by more than 60 percent ... Most of this was accomplished through the replacement of old perc equipment with machines designed to reduce perc vapors going into the air, and better waste management.++++++++++The US EPA regulates environmental releases of perc through a variety of laws including the CAA, the CWA, the Safe Drinking Water Act, the RCRA, and the CERCLA. For example, drycleaners are required to comply with EPA"s perc drycleaning NESHAP. This NESHAP has reduced the amount of perc released from drycleaning shops across the country. The FTC regulates the cleaning guidance on garment care labels. FTC is proposing changes to allow the labeling of garments now labeled "dryclean only" for environmentally preferable cleaning technologies.
Number of Sites:	30,000

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA Office of Pollution Prevention and Toxics
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1998)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.

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Source Citation:	U.S, E. P. A.. 1998. Design for the environment: Garment and textile care program.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982088

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Tn, D. E. C.. 1997. Cleaning the air on clean air: Strategies for perc drycleaners.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982090

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	According to 1991 EPA data, dry cleaners use 191.8 million pounds of perc annually.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Tennessee Department of Environment and Conservation & University of Tennessee Center for Industrial Services
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1991)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982092

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	In the perchloroethylene, or "perc" process, the most common process used by dry cleaners, the textiles are loaded into the contact tank and washed with perc, detergent, and a small amount of sizing. The perc is continuously filtered and returned to the washer. The textiles are then dried in either a wet transfer or a dry-dry operation depending on the type of unit used. The pert vapors are discharged into the air or condensed in a "sniffer" which reclaims the solvent...Figure 2 is representative of a perchloroethylene type dry cleaning system.
Total Annual U.S. Volume (and percent of PV):	According to Mr. Tom Bennett of Cavalier Cleaners, approximately 90 percent of dry cleaners use perc solvents, 7 percent use petroleum solvents, and 3 percent use Valclene and according to Mr. Wade Elam of White Way about 85 percent of all dry cleaners in the State of Tennessee are conditionally exempt hazardous waste generators, producing less than 100 kg (220 lbs) of waste per month.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Prepared by "EMPE, Inc. Consulting Engineers" for the Tennessee Department of Economic and Community Development
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1986)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.

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Source Citation:	Empe, Inc Consulting Engineers. 1986. Hazardous waste management study: Dry cleaners.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982092

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982095

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	The most widely used dry cleaning solvent in North Carolina is perchloroethylene (PERC)"Usages of PERC in the dry cleaning industry have dropped rather dramatically (by 75-80 percent) during the past 15 years, as shown in Fig. 7,
Number of Sites:	More than 30,000 dry cleaning plants operate in the United States, with about 675 in North Carolina.+++++The North Carolina Association of Launderers and Cleaners (NCALC) (whose membership operates over 275 plants) estimates that 60-80 percent of North Carolina dry cleaners are very small, family-owned, single plant businesses, with the balance being multi-plant operations.
Batch Size:	Table 1 shows that, on average, NC PERC dry cleaners used 287 gal./yr. in 1997. The "average" PERC dry cleaner cleans about 78,000 lbs. of clothes per year. Thus, the PERC dry cleaners" efficiency for 1997 was 272 lbs. clothes/gal. PERC. TheNC PERC process mix for 1997 was about 75 percent Generation 3, 15 percent Geneneration 4, and 10 percent transfers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	North Carolina Department of Environment and Natural Resources - Division of Pollution Prevention and Environmental Assistance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2001)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	Nc, Denr. 2001. Alternatives to the predominant dry cleaning processes.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982095

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Data sources, assessment methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2002. Occurrence summary and use support document for the six-year review of national primary drinking water regulations.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970165

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic Manufacture
Total Annual U.S. Volume (and percent of PV):	271 million pounds in 1993
Number of Sites:	3

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data from US
	Metric 3:	Applicability	Medium	× 2	4	Focuses on ambient levels but includes some release data
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2002 report with older data
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Pubchem,. 2017. PubChem: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970251

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture/Import/Export
Life Cycle Description (Subcategory of Use):	Domestic Manufacture/Imports
Process Description:	Prepared primarily by two processes: (1) The Huels method using direct chlorination of theylene yields 70 percent perc. (2) Hydrocarbons such as methane, ethane or propatne are chlorinated and pyrolyzed to yield over 95 percent perc.
Total Annual U.S. Volume (and percent of PV):	1987 domestic production was 4.7 x 10$\hat{8}$ pounds(625 million pounds in 1987 used)61 million pounds imported in 199648 million pounds exported in 1996

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	PubChem website
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Includes US data
	Metric 3:	Applicability	Medium	× 2	4	Some manufacture/use data, but aggregated
	Metric 4:	Temporal Representativeness	Low	× 2	6	Most numbers come from the 1970s-1990s
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Doesn't discuss uncertainty
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	Tetrachloroethylene may be produced by oxychlorination, chlorination and/or dehydrochlorination reactions of hydrocarbons or chlorinated hydrocarbons. The most common methods of production reported are the chlorination of propylene and the oxychlorination of 1,2-dichloroethane (Brooke et al, 1993). Carbon tetrachloride is also produced via the chlorination of propylene route, and the amounts produced are dependent upon the reaction conditions employed. Due to controls on the production and use of carbon tetrachloride, the current reaction conditions are likely to favour the production of tetrachloroethylene. Trichloroethylene and tetrachloroethylene are both produced by the oxychlorination of 1,2-dichloroethane route, and by varying the reaction conditions the amounts produced of either compound can be varied.
Total Annual U.S. Volume (and percent of PV):	In 2004, total European Union production capacity is in the range of 100,000 - 150,000 tonnes per annum (tpa); actual production reported as 148,074 tpa.Sales in the EU 25 countries plus Norway, Switzerland and Turkey totalled 56,000 tonnes in 2005. These figures have fallen since 1999 apparently due to more efficient dry-cleaning processes, greater recycling, use of enclosed systems and other good practices.Break-down of sales by application (e.g., dry cleaning agent, metal cleaning agent) are included in Table 2.2 (page 10 of 80).ECSA began a programme of voluntary activity in 1992 aimed at developing "Charters of Co-operation" with end user and distributor associations throughout Europe...As outlined in the RAR for tetrachloroethylene, since the programme began fourteen charters have been signed in six countries. Charters are in place in the UK and French metal finishing, surface cleaning and engineering industries.
Number of Sites:	4 in the European Union, in 2005

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Total Annual U.S. Volume (and percent of PV):	The largest company recycling tetrachloroethylene in the UK estimates that it processes approximately 870 tonnes per annum (tpa)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	More than 90 percent of European units used tetrachloroethylene as the dry-cleaning agent, although the southern European countries used more white spirit for dry-cleaning than those in the north.In 1994, tetrachloroethylene accounted for approximately 90 percent of the total solvent used by the dry cleaning industry within the EU.
Number of Sites:	in 1991 there were close to 60,000 dry cleaning establishments in the EU. According to this report there were 20,000 dry cleaning units in Italy, 9,000 in France, 6,400 to 6,950 in the UK, 6,600 in Spain, 6,600 in West Germany, 3,500 in Greece, 1,000 in Denmark, 1,000 in Portugal, 840 in the Netherlands, 800 in Ireland, 450 in Belgium and 50 in Luxembourg.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Process Description:	Tetrachloroethylene can be used in the vapour, boiling liquid, or ultrasonic cleaning of metalwork in the engineering industry. Due to its higher boiling point tetrachloroethylene can be more effective than other solvents in removing persistent deposits.In vapour degreasing, the solvent which is contained in a specially designed tank is heated to its boiling point to produce a controlled solvent vapour zone. The article to be degreased is placed in a cage that is then mechanically immersed into this vapour zone, the vapour condensing on the metal surface. The condensed solvent runs off the metal, washing away the impurities. The metal dries when it reaches the temperature of the vapour. The cage is lifted above the cooling coils (which prevent the vapour escaping) into the "free board" area where the liquid tetrachloroethylene flashes off.
Number of Sites:	The number of degreasing units in the EU which use tetrachloroethylene is not known.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Catalyst regeneration in petrochemical manufacturing
Process Description:	Two major companies in the oil industry confirmed that this use was ongoing. Further details obtained from them clarified that catalyst regeneration (to replace chloride leached out of the catalyst during the oil refining process) is a continuous closed system process involving limited exposure opportunities relative to manufacturing and packaging. The tasks carried out in this process are similar to those performed during manufacturing, although the volumes handled and frequency/ duration of tasks with the potential for exposure is expected to be significantly less.
Number of Sites:	2
Batch Size:	The reported use volumes were 15 96 litres per day (about 11 - 47 tpa) of tetrachloroethylene delivered via an automated closed dosing facility. The quantity of tetrachloroethylene used within the entire EU petroleum industry for catalyst generation is not known.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	United KingdomFor REACH Regulation (EC) 1907/2006
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2008)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.

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Source Citation:	Echa,. 2008. Annex XV restriction report: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970791

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970844

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	For many years, the most important process for producing tetrachloroethene was from acetylene via trichloroethylene, but because of the increasing price of acetylene feedstock in the 1970s, newer processes involving direct chlorination or oxychlorination of other hydrocarbons were introduced (ATSDR, 1997a).
Total Annual U.S. Volume (and percent of PV):	In 1992, annual capacity was 223,000 tonnes in the USA (Link et al., 1992). In 2007, the USA was the largest consumer of tetrachloroethene (43 percent of demand), followed by western Europe (19 percent), China (10 percent) and Japan (9 percent) (Glauser & Ishikawa, 2008).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	World Health Organization
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (pubished in 2014, but many cited studies were older)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970844

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970844

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Tetrachloroethene is ideally suited for dry-cleaning as it is nonflammable and a good degreaser that does not satuate the fabric fibres, thus avoiding swelling and shrinking of the fabric.
Total Annual U.S. Volume (and percent of PV):	In 2007, tetrachloroethene was used by about 70 percent of dry-cleaners in the USA" In a study in New Jersey communities in 1984, dry-to-dry machines were present in 75 percent of the facilities included.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	World Health Organization
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (pubished in 2014, but many cited studies were older)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Iarc,. 1999. IARC Monographs on the evaluation of carcinogenic risks to humans: Trichloroethylene, tetrachloroethylene, and some other chlorinated agents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970844

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1995. In-depth survey report: Control of perchloroethylene exposure in commercial dry cleaners at Appearance Plus Cleaners.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3974915

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Two un-vented, refrigerated, dry-to-dry machines, each less than 5-years old, were used at this shop" both had a refrigerated condenser as the primary vapor recovery device.
Number of Sites:	1
Batch Size:	The shop consumes an average of 30 gallons of PERC every 2 to 2.5 months. On a typical day, each machine processes approximately ten loads of clothing for a total of approximately 600 pounds of clothing a day.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1994)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2002. In-depth survey report: Control of perchloroethylene (PCE) in vapor degreasing operations, site #2.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3974916

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Process Description:	The three most commonly used halogenated solvents are methylene chloride, perchloroethylene, and trichloroethylene. Open-top vapor degreasers consist of several sections:" Vacuum or airless vapor degreasers consist of several components"
Number of Sites:	The EPA estimated that in 1991, there were about 2070 degreasers using perchloroethylene in the U.S. (Ref #7).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2002).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Moseley, C. L.. 1980. Health hazard evaluation report no. HHE 79-42-685, Motion Picture Screen Cartoonists, Local 841, New York, New York.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970614

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Photographic film
Process Description:	Optical shops are responsible for the production of finished 16 mm and 35 mm films. Animation, titles, and all other optical effects are filmed in the studios from optical negatives or feature films. These originals are first processed through a film cleaning unit which immerses film in a terrperature-controlled bath of solvent (methyl chloroform) then winds it through a series of pressure sensitive rollers to dry.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.With the advent of digital motion pictures, this occupational exposure is greatly reduced.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1980)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Moseley, C. L.. 1980. Health hazard evaluation report no. HHE 79-42-685, Motion Picture Screen Cartoonists, Local 841, New York, New York.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970614

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Burr, G. A.,Todd, W.. 1986. Health hazard evaluation report no. HETA 86-005-1679, Dutch Girl Cleaners, Springdale, Ohio.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970613

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Mall drycleaner uses a dry-to-dry PERC system (a single machine is used for washing, solvent extraction, and drying). Twin Permac R308 dry-to-dry units, manufactured by Bohler and Weber KG, are used at this location.
Number of Sites:	1
Batch Size:	PERC usage is approximately 100 gallons per month.A solvent recovery system, using a steam regenerated charcoal bed, had been installed 3 years ago on both dry-to-dry cleaning units. Capable of recovering up to 25 gallons of perchloroethylene per day, the system was currently salvaging 2.5 gallons per day.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1986)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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Source Citation:	Burr, G. A.,Todd, W.. 1986. Health hazard evaluation report no. HETA 86-005-1679, Dutch Girl Cleaners, Springdale, Ohio.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970613

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes: Summary.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970190

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Drycleaning uses organic solvents to clean soils from clothing. Commonly-used solvents are perc and hydrocarbon solvents. Perc drycleaning solvents are used by approximately 30,600 (85 percent) fabricare facilities in the U.S., while hydrocarbon solvents are used by approximately 5,400 (15 percent) facilities. In 1994, Exxon introduced a synthetic hydrocarbon solvent, called DF-2000, with a flashpoint above 140 F. Since then, several other firms have either introduced or are testing synthetic petroleum solvents for the drycleaning market...Professional wetcleaning is a relatively new process that uses water as the primary solvent to clean fabrics... anecdotal information indicate that the use of wetcleaning is steadily increasing.
Total Annual U.S. Volume (and percent of PV):	Figure 1: Solvent Usage in the Commercial Sector of the Drycleaning Industry
Number of Sites:	The professional clothes cleaning industry, includes approximately 36,000 facilities"Clothes cleaning volume for these facilities is estimated to be 1.9 billion pounds of clothes per year. More than 90 percent of the 36,000 commercial facilities in the U.S. are small neighborhood stores...

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from more than 20 years ago (1998)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes: Summary.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970190

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Eisenberg, J.,Ramsey, J.. 2010. Health hazard evaluation report no. HETA 2008-0175-3111, Evaluation of 1-Bromopropane use in four New Jersey commercial dry cleaning facilities.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970603

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	1-BP solvent can be used in the same machine as perc after a conversion process.
Total Annual U.S. Volume (and percent of PV):	The U.S. EPA will ban the use of perc in coresidential dry cleaning facilities as of December 20, 2020 [40 CFR 63.323(5) (i)].In 2007, CA became the first state to ban perc use in dry cleaning ahead of the federal ban, and other states, such as NC, NY, MS are contemplating similar actions. The NJ DEP has encouraged owners to replace their perc machines with hydrocarbon dry cleaning systems or professional wet cleaning systems [NJ DEP 2010b].
Number of Sites:	In August 2008, we visited four dry cleaning facilities that had converted their systems from perc to 1-BP.In 2007, the administrator of NJ DEP estimated that 1,500 of the 1,700 dry cleaning facilities in the state utilized perc systems.
Batch Size:	Facility 1 was using a Multimatic 35-pound machine (Multimatic, Northvale, New Jersey). Facility 2 was using a VIC 35-pound machine (Dalex, Concord, Ontario). Facility 3 used a Frimair 2025-pound machine (Frimair, Turnersville, New Jersey). Facility 4 was using a Frimair 3035-pound machine (Frimair, Turnersville, New Jersey).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CDC - NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Low	× 2	6	Covers conditions of use in scope, but no Perc usage or exposure data was included. Study retained because of the information on polution prevention.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (site visit 2008; published 2010).
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.

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Source Citation:	Eisenberg, J.,Ramsey, J.. 2010. Health hazard evaluation report no. HETA 2008-0175-3111, Evaluation of 1-Bromopropane use in four New Jersey commercial dry cleaning facilities.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970603

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1978. Control techniques for volatile organic emissions from stationary sources.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	40590

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Perchloroethylene is the only chlorinated hydrocarbon in widespread use. It is superior to petroleum solvents because it is nonflammable. Its disadvantages are high cost, aggressiveness to clothing, and slight corrosiveness.
Total Annual U.S. Volume (and percent of PV):	Industrial + commercial/consumer = 173,000 tons of the solvent yearly
Number of Sites:	270 industrial plants

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1978)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1978. Control techniques for volatile organic emissions from stationary sources.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	40590

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Number of Sites:	20,000 commercial units, and 30,000 coin-operated

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (1978)
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Blair, A.,Petralia, S. A.,Stewart, P. A.. 2003. Extended mortality follow-up of a cohort of dry cleaners. Annals of Epidemiology.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	630365

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Although a number of organic solvents have been used by the dry cleaning industry over the years, tetrachloroethylene (C2Cl4) became the solvent of choice in the 1960s and is the most important chemical used today (Ref #1). Approximately 50 percent of the tetrachloroethylene produced in the United States 1990 was used for dry cleaning.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	From the Department of Occupational Epidemiology, Branch Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD (A.B., P.A.S.); and Pfizer Pharmaceuticals, Inc., New York, NY.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (published in 2002; worker count from the 1980)
	Metric 5:	Sample Size	N/A		N/A	NA - general data and concepts (no actual release data)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Weiss, N. S.. 1995. Cancer in relation to occupational exposure to perchloroethylene. Cancer Causes and Control.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	631151

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	peer-reviewed article
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US data
	Metric 3:	Applicability	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines
	Metric 4:	Temporal Representativeness	Unacceptable	× 2	8	Data for dry cleaning; however, prior to ban on gen 1 machines
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.8.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	632416

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Process Description:	Organic solvents are widely employed in metal degreasing, cleaning, and drying operations in the metallic surface treatment and motor vehicle manufacturing industry among others. The most commonly used solvents are trichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, and dichloroethanes.
Total Annual U.S. Volume (and percent of PV):	capacity = 200 tonnes/yr
Number of Sites:	343According to the European Pollutant Emission Register (EPER, http://www.eper.cec.eu.int/, last access date: 30/10/2005), for the year 2001, there were 343 facilities dedicated to surface treatment with organic solvents in the European Union (EU) (28 in Spain), with a capacity higher than 200 tonnes/yr.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal Article. Authors from the University of Santiago de Compostela.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	European Union
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data over 10 years old (2006)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	Franco, A.,Costoya, M. A.,Roca, E.. 2007. Estimating risk during showering exposure to VOCs of workers in a metal-degreasing facility. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	632416

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 1998. Cleaner technologies substitutes assessment for professional fabricare processes.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970186

EXTRACTION

Parameter	Data
Life Cycle Stage:	Production/Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning solvent
Process Description:	Description and process flow diagrams of closed loop dry-to-dry and transfer machines on pg 52. Also discusses PERC recovery equipment
Total Annual U.S. Volume (and percent of PV):	136.4 million kg produced at 3 facilities in 1996;27.7 million kg imported in 1996;21.8 million kg exported in 1996;45 to 52.6 million kg PCE used by drycleaning in 1997
Number of Sites:	3 production;30600 dry cleaners in 1997

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	PCE dry cleaning data, though much of it is outdated technology
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from greater than 20 years ago (1980s and 1990s)
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Provides measurement, worker activity, but does not provide measurement duration or all sample locations
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	nan.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970879

EXTRACTION

Parameter	Data
Life Cycle Stage:	Production/Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning solvent/Solvents and/or Degreasers
Total Annual U.S. Volume (and percent of PV):	Document has a list of producers beginning on page 108, also several pages of historic manufacture and consumption patterns beginning on page 112

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	appropriate solvent use
	Metric 4:	Temporal Representativeness	High	× 2	2	2017 date, though much of the data are older
	Metric 5:	Sample Size	High	× 1	1	Data fully characterized
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			High		1.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Demond, A. H.. 1982. A source of tetrachloroethylene in the drinking water of New England: An evaluation of the toxicity of tetrachloroethylene and the prediction of its leaching rates from vinyl-lined asbestos-cement pipe.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	758556

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	The International Trade Commission (1978) cites PCE production in 1977 in the US as 300,000 metric tons and US consumption as 253,000 metric tons" dry cleaning accounted for approximatly 75 percent of the production and imports [pg 125 of 179].

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Master thesis for MIT
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data over 20 years old (submitted in 1983; cites data published in 1977)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Low		2.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ruder, A.. 2006. Potential health effects of occupational chlorinated solvent exposure. Annals of the New York Academy of Sciences.
Type of Data Source	Facility; Environmental Release Data;
Hero ID	707665

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Process Description:	Vapor degreasing operations
Total Annual U.S. Volume (and percent of PV):	136,000 tons in 1997
Possible Physical Form:	liquid/vapor

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	epidemiology lit. review, not full study
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from greater than 20 years ago (mostly 1990s)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Compliles data, doesn't characterize study
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	no discussion of variability or uncertainty
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1987. Current Intelligence Bulletin 48 Organic Solvent Neurotoxicity (with reference package).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	724690

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	provides gneral controls and PPE information applicable to all COUs
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Guidance on safe use: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970789

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	ECHA
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	EU (OECD)
	Metric 3:	Applicability	High	× 2	2	provides gneral controls and PPE information applicable to all COUs
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ashford, R. D.. 2001. Ashford's Dictionary of Industrial ChemicalsPerchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860439

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Published textbook
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	England
	Metric 3:	Applicability	High	× 2	2	Physical properties which apply to all COUs
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data from over 20 years ago
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness cannot be determined
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	data sources not transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not addressed.
Overall Quality Determination†			Medium		2.2	

* MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Marshall, K. A.,Pottenger, L. H.. 2004. Chlorocarbons and chlorohydrocarbons.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3859415

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Process Description:	Provides flow diagram of integrated manufacturing process for production of chlorocarbons and chlorohydrocarbons

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Published textbook
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Flow diagram of possible manufacture process
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	Not applicable
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Murphy, B. L.. 2016. Vapor degreasing with chlorinated solvents. Environmental Forensics.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3544388

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Process Description:	Solvent heated to boiling inside a tank b hot water, electricity or steam heating. Parts to be degreased are suspended over the boiling solvent. Boiling solvent rises, contacting parts, then reaches a "lid" of cold air which keeps solvent vapors in the tank. (diagram shown on page 3) May also include a pre-degreasing step of saturating part by spraying solvent before putting in tank, or a warm liquid solvent bath following the vapor degreasing.
Total Annual U.S. Volume (and percent of PV):	<100 million pounds/yr

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Environmental Forensics Journal
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	vapor degreasing
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2016 article, but most data is much older covering 1920s - 1980s
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Some meta data discussion
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Not discussed in detail
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Issa,. 2015. Summary of state and federal VOC limitations for institutional and consumer products.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982416

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Cleaners and degreasers (other)
Total Annual U.S. Volume (and percent of PV):	California, Indiana, and New Hampshire prohibits PERC in certain product categories (e.g., Electrical Cleaners, Electronic Cleaner, General Purpose Cleaner, General Purpose Degreaser)

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Cleaning industry trade association (ISSA, 3300 Dundee Rd., Northbrook, IL)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2010)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Kumar, N. S.,Palanivelu, K.. 2007. Pervaporative recovery of perchloroethylene from spent solvent of electroplating industry: Experiment and modelling studies. Journal of Scientific and Industrial Research.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3562132

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Process Description:	There is also no effective treatment method for the recovery of spent solvents. Distillation cannot be applied because formation of azeotropic mixtures and high energy costs. Carbon adsorption holds good promise for trace level but the disposal of spent carbon is a major problem. Pervaporation (PV) process is an experimental membrane separation process to concentrate organic solvents.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The "Journal of Scientific & Industrial Research" is a quality journal; the authors are employed by trusted sources (i.e., Anna University of Chennai India).
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	The data are from a non-OECD country.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope.One industy that might use this technology is not in scope (i.e., electroplating).
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2007)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

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Source Citation:	Kumar, N. S.,Palanivelu, K.. 2007. Pervaporative recovery of perchloroethylene from spent solvent of electroplating industry: Experiment and modelling studies. Journal of Scientific and Industrial Research.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3562132

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ministry of the, Environment. 2014. Latest development of chemical substances control law in Japan.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982450

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	Japanese annual "trend in shipment quantity" from 1988 through 2012

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Slide presentation by Japan's Chemical Evaluation Office Ministry of the Environment.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan is an OECD country
	Metric 3:	Applicability	Low	× 2	6	Covers conditions of use in scope, but it is simply a slide presentation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2014; most recent data from 2012).
	Metric 5:	Sample Size	Low	× 1	3	Single values, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Ecsa,. 2017. Chlorinated solvents: Perchloroethylene (PER).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982472

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	The use of closed systems is being strongly recommended by ECSA and is becoming Industry Standard" PER is the solvent of choice for most dry?cleaners.
Batch Size:	By use of modern closed dry?cleaning machines as recommended by ECSA, the amount needed to clean 1 kg of clothes has very much decreased (by 90 percent from 110 to 10 g solvent /kg).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2014).
	Metric 5:	Sample Size	Low	× 1	3	Single values, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Product safety summary on perchloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982135

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	Perchloroethylene is colourless liquid chlorocarbon. It is widely used for dry cleaning.
Total Annual U.S. Volume (and percent of PV):	In 2010 Perchloroethylene has been registered under the European Union REACH Regulation EC/1907/2006 and the substance was found to be safe for the uses identified.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Intermediate in basic organic chemical manufacturing
Process Description:	Perchloroethylene is mainly used as a chemical intermediate; in addition applications also exist in dry-cleaning, metal cleaning and degreasing.
Total Annual U.S. Volume (and percent of PV):	Use of perchloroethylene has fallen substantially since the mid-1980s due to more efficient dry-cleaning processes, greater recycling, use of enclosed systems, and other best practices.
Chemical Concentration:	Stabilizers are normally added to perchloroethylene to prevent its decomposition during storage and use" Due to its relatively high stability, PER requires less stabilizer to be added than other chlorinated solvents.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

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Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	European Chlorinated Solvents, Association. 2015. Health profile on perchlorethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Number of Sites:	In Europe, perchloroethylene is manufactured by (in brackets: production location): 1) Olin Corporation (Blue Cube Assests Germany), 2) Inovyn (France), and 3) Spolchemie (Czech Republic).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the European Chlorinated Solvents Association. The data used in the assessment is not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Most of Europe is included in the OECD.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2015).
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.5	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Erm,. 2017. Life cycle assessment of used oil management.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982372

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Process Description:	The Phase II LCA considers the most common types of recovery:" reclaiming of used oil to recovered fuel oil (RFO);" reprocessing to a marine diesel oil product (MDO);" reprocessing to vacuum gas oil (VGO); and" regeneration to produce a "re-refined base oil" (RRBO).
Total Annual U.S. Volume (and percent of PV):	The Phase I report estimated that 113,000 (metric) tonnes of the 435,000 tonnes of used oil generated in CA in 2010 were burned, dumped or landfilled instead of being collected and managed formally. The majority of the collected used oil was processed into MDO (marine diesel oil), believed to be used mainly by shipping...CA has a well-established system for the management of used oil. In 2009, Senate Bill 546 (Lowenthal) included a number of changes to the applicable system of fees and incentives"
Chemical Concentration:	Used oil, virgin fuels, and re-refined petroleum products contain PCE; see tables 10.2, 10.5, and 10.6 (pages 178, 184, and 188 of 367).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	LCA authored by "Environmental Resources Management" to satisfy CA Senate Bill 546 (Lowenthal).
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	California specific.
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (published in 2016).
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of sample is characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described

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Source Citation:	Erm,. 2017. Life cycle assessment of used oil management.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982372

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 2001. NIOSH drycleaning study updated.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982091

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	Perchloroethylene demand in the U.S. drycleaning industry was 59 million pounds (26,700 metric tons) in 2000 according to an annual survey of suppliers conducted by the Textile Care Allied Trades Association (TCATA). The figure represents a 6-percent decline from the 63 million pounds (28,500 metric tons) TCATA reported in 1999. Overall demand in the drycleaning industry has dropped by 73 percent over the last 10 years.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (data from 1999 and 2000)
	Metric 5:	Sample Size	Low	× 1	3	Single values, no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	Since being introduced to the drycleaning industry in the late 1930s, it has replaced most other solvents because of its relatively low toxicity and nonflammability.
Total Annual U.S. Volume (and percent of PV):	Total U.S. demand for the chemical in 1998 was estimated to be about 344 million pounds (156,000 metric tons), of which about 30 million pounds (13,600 metric tons) were imported. An additional 40 million pounds (18,100 metric tons) were exported.For 1998, the use of perchloroethylene can be broken down into the following categories: 1) chemical intermediate - 50 percent , 2) dry cleaning/ textile processing - 25 percent , 3) automotive aerosols - 10 percent , 4) metal cleaning/degreasing - 10 percent , 5) miscellaneous - 5 percent
Number of Sites:	In the United States, perchloroethylene is manufactured by the Dow Chemical Company, PPG Industries, Inc., and Vulcan Materials Company.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Intermediate in industrial gas manufacturing
Process Description:	Perchloroethylene is used as a basic raw material in the manufacture of hydrofluorocarbon (HFC) 134a , a popular alternative to chlorofluorocarbon (CFC) refrigerants. It also is used in the synthesis of hydrochlorofluorocarbon (HCFC) 123 and 124 and HFC 125.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	In addition to its nonflammability and relatively low toxicity, the popularity of perchloroethylene in the dry cleaning industry can be attributed to the following properties: 1) safe to use on all common textiles, fibers, and dyes; 2) effective at removing fats, oils, and greases; 3) free of residual odor; etc.The textile industry uses perchloroethylene as a spotting agent for the removal of spinning oils and lubricants. It also is used in wool scouring and as a solvent carrier in dyes and water repellents.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Aerosol cleaner
Process Description:	Perchloroethylene has replaced 1,1,1-trichloroethane in aerosol formulations for the automotive aftermarket, particularly for brake cleaning. These formulations provide auto repair shops with highly effective, nonflammable products.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Process Description:	Many industries, including aerospace, appliance, and automotive manufacturers, use perchloroethylene for vapor degreasing metal parts during various production stages. Its high boiling point and resultant longer cleaning cycle are advantageous in removing "difficult" soils such as waxes with high melting points. The ability of the chemical to remove water during vapor degreasing is useful to jewelry manufacturers and other metal finishers.Perchloroethylene"s nonflammability and low vapor pressure make it an effective cold (room temperature) metal cleaner, when used in compliance with applicable regulatory requirements. Its low vapor pressure contributes to reduced emissions from cold cleaning operations where it is employed.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Trade association, the Halogenated Solvents Industry Alliance, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	Hsia,. 1999. HSIA perchloroethylene white paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982093

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Mehta S, Besore T.. 1989. Alternatives to organic solvents in metal-cleaning operations.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982094

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Total Annual U.S. Volume (and percent of PV):	Most common has been the use of organic solvents, especially in degreasing operations. For example, the percent of the market for four key chlorinated solvents used specifically for metal cleaning and degreasing is 9 percent for methylene chloride, 44 percent for trichloroethane, 85 percent for trichoroethylene, and 11 percent for perchloroethylene (Chemical Week, 1987).

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Illinois Hazardous Waste Research & Information Center
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1989)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.1	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Mehta S, Besore T.. 1989. Alternatives to organic solvents in metal-cleaning operations.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982094

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Recycling
Number of Sites:	Safety-Kleen777 Big Timber RoadElgin, IL 60120Sea Corporation75 Sanger StreetP.O. Box 5098Peoria, IL 61601Solvent Systems Interna"l, Inc.339 W. River Rd.Elgin, IL 60123

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Illinois Hazardous Waste Research & Information Center
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1989)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Biodegradation in water: screening tests: Tetrachloroethylene, Part 2.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970794

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Total Annual U.S. Volume (and percent of PV):	100,000-150,000 tons/yr
Number of Sites:	In 2000 8 manufacturers in Europe, 5 of those in Germany. By 2005 only 4 remain.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	UK Govn't
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Cohort study, some direct exposure numbers
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Published 2008, but much of the data are older
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness cannot be determined
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Biodegradation in water: screening tests: Tetrachloroethylene, Part 2.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970794

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Process Description:	PCE used in 90 percent of EU dry cleaners in 1991
Number of Sites:	60000

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	UK Govn't
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Cohort study, some direct exposure numbers
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Published 2008, but much of the data are older
	Metric 5:	Sample Size	Low	× 1	3	statistical representativeness cannot be determined
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability included
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Echa,. 2017. Uses by industrial workers: Tetrachloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970796

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	ECHA
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	includes in scope uses
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Almost no metadata givem only lists general environmental release and process category information that provides nothing more than what is already included in the Use list
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	No Comment.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 1.7.

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Fda,. 1977. Evaluation of production cleaning processes for electronic medical devices: Part II, cleaning solvents.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974802

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers
Process Description:	Chlorinated cleaners have relatively higher boiling points and are more aggressive incleaning action than the fluorinated cleaners. Because of this they are typically usedin cold-cleaning operations. Fluorinated solvents have a lower boiling temperatureand gentler solvency action and are used in both vapor degreasers and for coldcleaning. Degreaser solvents are generally azeotropes or blends of solvents thathave the same composition in the liquid and vapor phase.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	FDA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Low	× 2	6	Describes benefits and problems of using various types of solvents for different jobs.
	Metric 4:	Temporal Representativeness	High	× 2	2	2017
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	Not applicable
Overall Quality Determination†			High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 1978. Current intelligence bulletin 20: tetrachloroethylene (perchloroethylene).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978137

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent, Solvents and/or Degreasing
Total Annual U.S. Volume (and percent of PV):	700 million pounts produced in US
Number of Sites:	20,000 drycleaners

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Doesn't provide study numbers, but does address applicable uses and exposures
	Metric 4:	Temporal Representativeness	Low	× 2	6	Most data 1977 or earlier
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		2.0	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Niosh,. 2012. Drycleaning.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978136

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning Solvent
Number of Sites:	36000
Possible Physical Form:	liquid/vapor

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Doesn't provide study numbers, but does address applicable uses and exposures
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Most data 1990s
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	N/A		N/A	not applicable
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	McComas, C.. 1996. Dry cleaning equipment upgrades cut costs and reduce perc.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982078

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	To discourage perc use, taxes and fees comprise approximately 50 percent of purchasing costs.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Small Businesses Assistance Program (SBAP) at the Minnesota Pollution Control Agency
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1996)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	University of, Minnesota. 2017. Dry cleaners; Waste and emission reduction alternatives.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982082

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Total Annual U.S. Volume (and percent of PV):	Perc purchasing costs continue to rise due to taxes and fees levied in several states, including Minnesota, to support perc cleanup funds.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Minnesota Technical Assistance Program, University of Minnesota
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1997)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Irta,. 2000. Brake cleaning with water-based cleaning systems.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982085

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Aerosol spray degreaser/cleaner
Process Description:	Aerosol brake cleaners are used in most auto repair shops in the country...Brake service operations can include inspections, adjustments, brake pad replacements, and rotor resurfacing...During brake jobs, it is conventional for technicians to clean with aerosol brake cleaners.
Total Annual U.S. Volume (and percent of PV):	On April 27,2000, the California Air Resources Board (CARB) board banned PERC and other chlorinated solvents in automotive aerosol products, including brake cleaner.
Number of Sites:	This regulation affected 40,000 parts cleaners in Southern California-25,000 in auto repair facilities and 15,000 in industrial facilities.There are 329,000 auto repair facilities in the country.
Batch Size:	A survey by Brake & Front End Magazine indicates that, in 1996, facilities in the United States performed an average of 15.6 brake jobs each week.
Chemical Concentration:	CARB received information on 89 different brake cleaning products, 33 of which contained PERC...The PERC content in these products was between 22 and 98 percent.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Institute for Research and Technical Assistance (IRTA)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data more than 10 years old (published in 2000)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						

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Source Citation:	Irta,. 2000. Brake cleaning with water-based cleaning systems.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982085

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Cohen, L.. 1992. Special report: Dry cleaning fumes cause health worries, push search for alternatives.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982086

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	"the industry has cut use of perc in half in the past 20 years, whiie increasing the volume of clothing handled. And he says 75 percent to 80 percent of the industry now has the technology required to meet the imminent EPA standards.
Total Annual U.S. Volume (and percent of PV):	Estimates of perc production for 1988 were amost 500 million pounds, according to a Greenpeace report; William Fischer of the International Fabricare Institue says 40 percent to 45 percent of the yearly total is used by dry cleaners. The rest is used by textile manufacturers and as an industrial solvent.
Number of Sites:	900 dry cleaning establishments in the Chicago market,
Batch Size:	One Chicago cleaner with a brand-new $60,000 machine, which processes a 50-pound load in about 40 minutes, says he buys 100 gallons of perc approximately every four months.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Article is publised in a journal (i.e., The Neighborhood Works) that is not peer reviewed; the techniques used in the report are not specified.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (published in 1992)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						

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Source Citation:	Cohen, L.. 1992. Special report: Dry cleaning fumes cause health worries, push search for alternatives.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982086

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		Low		2.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Silicon Valley, Chemlabs. 1991. Safe replacement solvents and alternative technologies: Industry's choice.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982096

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Total Annual U.S. Volume (and percent of PV):	US Chemical Production in 1988 = 550 million pounds.The following classes of materials can be used for degreasing applications either pure or blended with other safe solvents e.g., petroleum distillates, emulsions, terpene natural products.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Sponsored by The California Department of Health Services - The Association of Bay Area Governments (ABAG) by Silicon Valley Chemlabs, Inc.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Covers conditions of use in scope
	Metric 4:	Temporal Representativeness	Low	× 2	6	Data more than 20 years old (data from 1988)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Medium		2.2	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	His,. 2016. The economic benefits of chlorine chemistry in fluorocarbons in the United States and Canada.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978162

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Domestic manufacture
Process Description:	Fluorocarbons are manufactured by the controlled fluorination of an organic starting material that is selected to produce the desired product...Control of the fluorination process and of the distribution of co-products and by-products, however, may be facilitated by utilizing starting materials that contain more chlorine than is required on the final products. In these cases, the extra chlorine is converted into hydrogen chloride and separated from the products. This approach was quite common in the production of CFCs and HCFCs, and typical starting materials include methylene chloride, chloroform, carbon tetrachloride, trichloroethylene, perchloroethylene, and trichloroethane.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The American Chemistry Council
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2016)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.

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Source Citation:	His,. 2016. The economic benefits of chlorine chemistry in fluorocarbons in the United States and Canada.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978162

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	His,. 2016. The economic benefits of chlorine chemistry in fluorocarbons in the United States and Canada.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978162

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Intermediate in industrial gas manufacturing
Process Description:	Methylene chloride, chloroform, vinyl chloride, trichloroethylene, perchloroethylene, and trichloroethane can be used to produce HFC-23, HFC-32, HFC-125, HFC-134a, HFC-143a and HFC152a.
Total Annual U.S. Volume (and percent of PV):	US and Canadian consumption of all fluorocarbon products in 2014 amounted to about 937 million pounds.In the US, the EPA has implemented the Montreal Protocol on Substances that Deplete the Ozone Layer under the terms of the CAA to stipulate the permissible conditions for use of fluorocarbons and other ozone depleting substances (ODS). Also stipulated are conditions involving their manufacture, controls on potentially emissive uses, recycling, labeling, disposal, and the use of alternatives. Currently, the US EPA also regulates fluorocarbons with global warming potential under the Significant New Alternatives Policy (SNAP), 40 C.F.R., Part 82, Subpart G.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The American Chemistry Council
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2016)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						

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Source Citation:	His,. 2016. The economic benefits of chlorine chemistry in fluorocarbons in the United States and Canada.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978162

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†		High		1.6	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Osha,. 1999. Sampling and analytical methods: Tetrachloroethylene trichloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978317

EXTRACTION

Parameter	Data
Total Annual U.S. Volume (and percent of PV):	About 50 percent of the demand for PCE is used in the dry cleaning industry where around 80 percent of all dry cleaners use it as their primary cleaning agent. It is also used as a feedstock in the production of fluorocarbons, which accounts for 30 percent of the current demand. About 12 percent of the demand is used as a degreaser for metals and the remaining 8 percent is utilized in misc. applications such as transformer insulating fluid, chemical maskant formulations, and process solvent for desulfurizing coal.

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US Dept. of Labor
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Description of measurement method
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (1999)
	Metric 5:	Sample Size	Low	× 1	3	Distribution of solvent content is characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Describes the precision of the overall proceedure and elements of the measurement method.
Overall Quality Determination†			Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Carex, Canada. 2017. Profiles and estimates: Trichloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978380

EXTRACTION

Parameter	Data
Life Cycle Stage:	unknown
Life Cycle Description (Subcategory of Use):	unknown
Process Description:	Trichloroethylene is a clear liquid at room temperature with a sweet, chloroformlike odour. Produced commercially since the 1920s, trichloroethylene has been used as a solvent and degreaser. Trichloroethylene is related to another chlorinated solvent, tetrachloroethylene (also called perchloroethylene or PERC).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	CAREX Canada is a multidisciplinary team of researchers based at the Faculty of Health Sciences at Simon Fraser University
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Canada is in OECD
	Metric 3:	Applicability	Unacceptable	× 2	8	Information is for TCE not PERC
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2017)
	Metric 5:	Sample Size	N/A		N/A	N/A - only qualitative information provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assumptions are clearly stated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty.
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Carex, Canada. 2017. Profiles and estimates: Trichloroethylene.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978380

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments

★★ Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Navigant Consulting, Inc. 2016. Energy savings potential and RDandD opportunities for commerical building appliances (2015 update).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974987

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial/consumer use
Life Cycle Description (Subcategory of Use):	Dry cleaning solvent
Process Description:	The traditional dry-cleaning process uses a solvent called perchloroethylene, often referred to as PCE or PERC. One major manufacturer"s PCE equipment ranges from 35 to 165 pound capacities, with most models falling between 40 and 100 pounds.A dry-cleaning machine is similar to a commercial clothes washer extractor. Garments are placed into a cylindrical washing/extraction chamber, which contains a horizontal-axis, perforated drum that rotates within an outer shell. The outer shell holds the solvent while the rotating drum holds the garment load. The capacity of a dry-cleaning machine can range between 30 and 135 pounds of garments.
Total Annual U.S. Volume (and percent of PV):	During the 1980s, the EPA and state environmental agencies began regulating PCE as a contaminant in 1993, EPA implemented regulations for dry-cleaning PCE. To deal with tightening regulation on PCE emissions, the dry-cleaning industry began installing increasingly complex pollution control devices for recapturing PCE liquid and vapors. Modern equipment has been largely successful in decreasing PCE emissions, though often at the expense of energy efficiency.California has recently banned the use of perchloroethylene. This ban will be implemented in a phased approach and is to be completed by January 1, 2023.
Number of Sites:	avg: 33,000Dry-cleaning equipment installed base estimates were found from 2 sources and presented in Table 8-10.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	US DOE
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	USA

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Source Citation:	Navigant Consulting, Inc. 2016. Energy savings potential and RDandD opportunities for commerical building appliances (2015 update).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974987

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
	Metric 3:	Applicability	Medium	× 2	4	Occupational scenario within the scope of the risk evaluation, but information is general.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data from less than 10 years ago (2016)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	U.S, E. P. A.. 2001. Guide to industrial assessments for pollution prevention and energy efficiency.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827322

EXTRACTION

Parameter	Data
Life Cycle Stage:	Industrial use
Life Cycle Description (Subcategory of Use):	Solvents and/or Degreasers (cold, aerosol spray or vapor degreaser; not specified in comment)
Process Description:	Cleaning and degreasing processes are applied in a variety of industries to remove dirt, soil, and grease (often referred to together as soil). Cleaning and degreasing are done as a final step in manufacturing a product, as a preliminary step in preparing a surface for further work (e.g., electroplating), or as a cleaning step for forms or equipment between uses...Vapor degreasing generally involves chlorinated solvents such as methylene chloride, I ,I ,I-trichloroethane, trichloroethylene, or perchloroethylene. Parts are immersed in the vapors of these solvents for degreasing. In the dry cleaning industry, perchloroethylene is commonly used for washing clothes.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	US EPA
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	Medium	× 2	4	Occupational scenario within the scope of the risk evaluation, but information is general.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data from less than 20 years ago (2001)
	Metric 5:	Sample Size	Low	× 1	3	Statistics not given
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Data sources clearly described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability

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Source Citation:	U.S, E. P. A.. 2001. Guide to industrial assessments for pollution prevention and energy efficiency.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827322

EVALUATION

Domain	Metric	Rating	MWF★	Score	Comments
Overall Quality Determination†		Medium		1.9	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Halogenated Solvents Industry Alliance. 2008. Perchloroethylene - White Paper.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5099139

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	Multiple - market report
Total Annual U.S. Volume (and percent of PV):	70 percent intermediate; 10 percent dry cleaning; 10 percent auto aerosols; 7 percent metal cleaning; 3 percent misc

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Halogenated Solvents Industry Alliance
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	USA
	Metric 3:	Applicability	High	× 2	2	Market data for in-scope conditions of use
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less 10 years old
	Metric 5:	Sample Size	Low	× 1	3	data characterized by no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Results given but sources not fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	California Air Resources Board. 2000. Initial statement of reasons for the proposed airborne toxic control measure for emissions of chlorinated toxic air contaminants from automotive maintenance and repair activities.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5071458

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Aerosol degreasing
Number of Sites:	73 percent of facilitiies use brake cleaning products, 37 percent of available brake cleaners container PCE, 44 percent of products sold contain PCE

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CARB is expected to use reliable data collection and survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data surveyed and collected from U.S. (California) facilities
	Metric 3:	Applicability	High	× 2	2	data are specific to brake servicing and include market data and formulation data for PERC
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2000)
	Metric 5:	Sample Size	Medium	× 1	2	Some data elements from site visits include all individual data points; some surveyed data elements include some statistics (more than range but not full distribution), and some data elements have limited distribution information.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Report fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Report discusses and addresses variability and uncertainty.
Overall Quality Determination†			High		1.3	

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Source Citation:	U.S, E. P. A.. 2006. Economic impact analysis of the perchloroethylene dry cleaning residual risk standard.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827375

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Number of Sites:	12 industrial dry cleaners

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA document
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US dry cleaning industry
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data less than 20 years old (2006)
	Metric 5:	Sample Size	Low	× 1	3	data characterized by no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Report fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Dry Cleaning and Laundry Institute International and the National Cleaners Association. 2017. Public comment on tetrachloroethylene. TSCA review and scoping. EPA-HQ-OPPT-2016-0732.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827403

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Dry Cleaning
Number of Sites:	60 percent of dry cleaners use PCE

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry trade expected to have reliable market data
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US dry cleaning industry
	Metric 3:	Applicability	High	× 2	2	Data for dry cleaning
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2017)
	Metric 5:	Sample Size	Low	× 1	3	data characterized by no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Results given but sources not fully transparent
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			Medium		1.7	

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† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	AC Products. 2017. Maskants and their use in aerospace: Regulatory compliance of the industry. EPA-HQ-OPPT-2016-0732-0077.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5176391

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Maskant
Number of Sites:	71 sites use PCE maskants

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Industry trade expected to use reliable market data
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US chemical maskant uses
	Metric 3:	Applicability	High	× 2	2	Data for chemical maskants
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2017)
	Metric 5:	Sample Size	Low	× 1	3	data characterized by no statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.4	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Winfield Brooks Company. 2014. Safety Data Sheet: Original Formula Alumtap.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5099118

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Metalworking fluid
Process Description:	oil-based cutting and tapping fluid
Chemical Concentration:	<10 percent

EVALUATION

Domain	Metric		Rating	MWF★	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	SDS assumed to use reliable concentration data
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data for US metalworking fluid product
	Metric 3:	Applicability	High	× 2	2	Data for metalworking fluid
	Metric 4:	Temporal Representativeness	High	× 2	2	Data less than 10 years old (2014)
	Metric 5:	Sample Size	Medium	× 1	2	concentration of PCE in formulation characterized by range
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Sources fully described
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	does not address variability
Overall Quality Determination†			High		1.3	

★ MWF = Metric Weighting Factor

† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.