United States
Environmental Protection Agency

Office of Chemical Safety and
Pollution Prevention

Final Risk Evaluation for

Asbestos

Part 1: Chrysotile Asbestos

Systematic Review Supplemental File:

Data Quality Evaluation of Environmental Releases and Occupational Exposure Common Sources

December 2020

This document is a compilation of tables for the data extraction and evaluation of common sources for environmental releases and occupational exposure of the first 10 chemicals. This document may contain sources that were not used for the final risk evaluation of Asbestos. 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.

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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:	U.S. EPA. 2017. Toxics Release Inventory (TRI), reporting year 2016.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5041148

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 2016
	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:	U.S. EPA. 2017. Toxics Release Inventory (TRI) basic plus data file, Hexabromocyclododecane (CAS # 25637-99-4), reporting year 2017.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5079078

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:	U.S. EPA. 2016. EPA Discharge Monitoring Report Data.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5176443

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 2016
	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.

Source Citation:	U.S. EPA. 2018. 2014 National Emissions Inventory Report.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	4795870

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 2014
	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:	U.S. EPA. 2018. 2014 National Emissions Inventory Report.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	4795870

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. EPA. 1995. Protocol for Equipment Leak Emission Estimates. EPA-453/R-95-017.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5097879

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Tank Truck and Railcar Loading Model
Release or Emission Factor:	Cited for emission factors used for the inhalation exposure and release model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA coordinated the data gathering activities; methodology expected to be accurate and comprehensive of all leak release sources.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are U.S. based.
	Metric 3:	Applicability	Medium	× 2	4	EPA-coordinated studies were of synthetic organic chemical manufacturing industry (SOCMI) type facilities, which may include industries within the scopes of the chemicals, but may also include industries outside of the scopes.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Underlying data collected through studies from 1980 to 1990. Data more than 20 years old.
	Metric 5:	Sample Size	Low	× 1	3	Emission factors are presented only as averages; underlying distribution is not characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Metadata includes release media and equipment type that is the source of the release. Does not include the duration over which the emission factors were derived.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Does not address variability or uncertainty in average emission factors.
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:	OPW Engineered Systems. 2014. Loading Systems Catalog. OPW Engineered Systems: A Dover Company. ES-LS-6/15-2M; Uploaded November 18, 2014.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5097888

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Tank Truck and Railcar Loading Model
Release or Emission Factor:	Cited for loading arm volumes used to calculate air emissions in model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Data are provided by loading systems vendor; it is expected vendor would provide accurate data on their own loading systems.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Vendor is U.S. based.
	Metric 3:	Applicability	High	× 2	2	The loading systems offered in vendor's catalog are applicable for the container types within scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Catalog is indicated as copyrighted as of 2015.
	Metric 5:	Sample Size	High	× 1	1	Vendor's catalog offers loading systems of a variety of sizes, and dimensions are provided for each offered size.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All needed metadata for loading system dimensions are provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability among loading systems across vendors is unknown; it is uncertain if the distribution of this vendor's products are capture the distribution across all vendors. However, it is expected that these systems are a reasonable representation of the systems offered in the U.S.
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.

Occupational Exposure

Source Citation:	U.S. BLS. 2016. May 2016 Occupational Employment and Wage Estimates: National Industry-Specific Estimates.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5079087

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Number of Sites:	Used to develop a method to estimate number of sites and workers.
Number of Workers:	Used to develop a method to estimate number of sites and workers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	BLS is expected to use reliable survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based economic data
	Metric 3:	Applicability	High	× 2	2	These economic data cover all industry and occupation types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	The BLS OES data are from 2016
	Metric 5:	Sample Size	High	× 1	1	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in 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:	U.S. Census Bureau. 2015. Statistics of U.S. Businesses (SUSB).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5097881

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Number of Sites:	Used to develop a method to estimate number of sites and workers.
Number of Workers:	Used to develop a method to estimate number of sites and workers.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. Census Bureau is expected to use reliable survey and census methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based economic data
	Metric 3:	Applicability	High	× 2	2	These economic data cover all industry and occupation types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	The Census Bureau SUSB data are from 2015
	Metric 5:	Sample Size	High	× 1	1	The SUSB is a compilation of data extracted from the Business Register, U.S. Census Bureau's "most complete, current, and consistent data for U.S. business establishments." Incorporates data from economic censuses and current business surveys, quarterly and annual Federal tax records, and other departmental and federal statistics. Expected to be sufficiently representative. (https://www.census.gov/programs-surveys/susb/about.html)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	U.S. Census Bureau documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in results.
Overall Quality Determination†			High		1.2	

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Source Citation:	U.S. Census Bureau. 2015. Statistics of U.S. Businesses (SUSB).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5097881

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. BLS. 2014. Employee Tenure News Release.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5080421

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Exposure Frequency:	Used to develop estimates of exposure frequency (working days per year and working years)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	BLS is expected to use reliable survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based economic data
	Metric 3:	Applicability	High	× 2	2	These economic data cover all industry types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Median employee tenure with current employer was obtained from the BLS Current Population Survey for January 2014.
	Metric 5:	Sample Size	High	× 1	1	The Current Population Survey (CPS) is a monthly survey of about 60,000 households. BLS provides detailed statistical treatment of surveys. Expected to be sufficiently representative. (https://www.bls.gov/cps/documentation.htm#reliability)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in 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:	U.S. BLS. 2015. Hours and Employment by Industry Tables - August 6, 2015.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5079873

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Exposure Frequency:	Used to develop estimates of exposure frequency (working days per year and working years)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	BLS is expected to use reliable survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based economic data
	Metric 3:	Applicability	High	× 2	2	These economic data cover all industry types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Hours and employment data are from 2016.
	Metric 5:	Sample Size	High	× 1	1	BLS Labor Productivity and Costs data are used to aid economic policymaking, among other uses, and are expected to be sufficiently representative.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in 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:	U.S. Census Bureau. 2019. Survey of Income and Program Participation data.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5080429

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Exposure Frequency:	Used to develop estimates of exposure frequency (working days per year and working years)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	U.S. Census Bureau is expected to use reliable survey and census methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based economic data
	Metric 3:	Applicability	High	× 2	2	These economic data cover all industry types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	EPA used the 2008 SIPP Panel Wave 1 (interview months of September through December 2008).
	Metric 5:	Sample Size	High	× 1	1	The SIPP survey is a continuous series of national panels, with sample size ranging from 14,000 to 52,000 interviewed households. Panels range from 2.5 to 4 years. Expected to be sufficiently representative. (https://www.census.gov/programs-surveys/sipp/about/sipp-introduction-history.html)
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in 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:	Cherrie, JW; Semple, S; Brouwer, D. 2004. Gloves and Dermal Exposure to Chemicals: Proposals for Evaluating Workplace Effectiveness. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5080435

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.
PPE:	Provides concepts of glove effectiveness.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies effectiveness of gloves in the workplace, which is applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Article was published in 2004; more than 10 but less than 20 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article presents concepts of dermal exposure and glove effectiveness. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/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:	Dancik, Y; Bigliardi, PL; Bigliardi-Qi, Mei. 2015. What happens in the skin? Integrating skin permeation kinetics into studies of developmental and reproductive toxicity following topical exposure. Reproductive Toxicology.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3223617

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies skin permeation kinetics, which is applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Article was published in 2015; less than 10 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article studies science of skin permeation and toxicity. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/uncertainty.
Overall Quality Determination†			High		1.0	

* 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:	Frasch, HF; Bunge, AL. 2015. The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. Journal of Pharmaceutical Sciences.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3230538

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies transient dermal exposure of volatile chemicals that evaporate and absorb into skin simultaneously, which is applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Article was published in 2015; less than 10 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article studies science of skin permeation and evaporation. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/uncertainty.
Overall Quality Determination†			High		1.0	

* 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:	Frasch FH. 2012. Dermal Absorption of Finite doses of Volatile Compounds. Journal of Pharmaceutical Sciences.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5097903

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies transient dermal exposure of volatile chemicals that evaporate and absorb into skin simultaneously, which is applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Article was published in 2012; less than 10 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article studies science of skin permeation and evaporation. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/uncertainty.
Overall Quality Determination†			High		1.0	

* 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:	Frasch, HF; Dotson, GS; Barbero, AM. 2011. In vitro human epidermal penetration of 1-bromopropane. Journal of Toxicology and Environmental Health, Part A: Current Issues.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1247930

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies human epidermal penetration of 1-BP, which is applicable to the scope of 1-BP.
	Metric 4:	Temporal Representativeness	High	× 2	2	Article was published in 2011; less than 10 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article studies science of skin permeation and evaporation. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/uncertainty.
Overall Quality Determination†			High		1.0	

* 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:	Garrod, AN; Phillips, AM; Pemberton, JA. 2001. Potential exposure of hands inside protective gloves"a summary of data from non-agricultural pesticide surveys. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5080256

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Study measured dermal exposures during activities in the UK.
	Metric 3:	Applicability	High	× 2	2	Study measured dermal exposures during occupational activities, which is generally relevant to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Article was published in 2001; more than 10 years but less than 20 years old.
	Metric 5:	Sample Size	High	× 1	1	Statistics of the inside-glove exposures measured are well characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Metadata of the measured exposures are well documented.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/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:	Kasting, BG; Miller, MA. 2006. Kinetics of finite dose absorption through skin 2: Volatile compounds. Journal of Pharmaceutical Sciences.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5018573

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope is not applicable to scientific research of dermal exposures.
	Metric 3:	Applicability	High	× 2	2	Article studies transient dermal exposure of volatile chemicals that evaporate and absorb into skin simultaneously, which is applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Article was published in 2006; more than 10 years but less than 20 years old.
	Metric 5:	Sample Size	N/A		N/A	N/A. Article studies science of skin permeation and evaporation. Sample size is not applicable.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/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:	Marquart, H; Franken, R; Goede, H; Fransman, W; Schinkel, J. 2017. Validation of the dermal exposure model in ECETOC TRA. Annals of Work Exposures and Health.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5080455

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	N/A		N/A	N/A. Geographic scope not applicable to the validation of the ECETOC TRA model.
	Metric 3:	Applicability	High	× 2	2	ECETOC TRA model and exposure studies used for validation cover a variety of occupational scenarios, which are applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	Article was published in 2017; less than 10 years old.
	Metric 5:	Sample Size	Medium	× 1	2	Statistics of dermal exposure observations obtained from the literature are not fully characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Article is well documented with methods, assumptions, and results; however, sources used from literature search are not fully described and the metadata associated with the literature review exposure studies are not provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/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:	Baldwin, PE; Maynard, AD. 1998. A Survey of Wind Speed in Indoor Workplaces. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045135

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Route of Exposure:	Used to develop a dermal exposure assessment method for volatile liquids.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Article studied wind speeds in indoor workplaces in the UK.
	Metric 3:	Applicability	High	× 2	2	The types of workplaces studied include workplaces applicable to the scopes of multiple chemicals.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Article was published in 1998; more than 10 years but less than 20 years old.
	Metric 5:	Sample Size	High	× 1	1	Statistics of wind speed surveys are well characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article is well documented with methods, assumptions, results, and sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Detailed discussion on variability/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:	OSHA. 2017. Chemical Exposure Health Data (CEHD) provided by OSHA to EPA.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3827305

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Exposure Concentration (Unit):	Provides personal breathing zone and area monitoring data.

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	High	× 2	2	Data provided by OSHA are not more than 10 years old.
	Metric 5:	Sample Size	High	× 1	1	Individual measurements are provided so the sample sets can be fully statistically characterized.
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. Worker job descriptions provided, but often lacks sufficient clarity.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	OSHA data do not discuss 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:	Defense Occupational and Environmental Health Readiness System - Industrial Hygiene (DOEHRS-IH). 2018. Email between DOD and EPA: RE: [Non-DoD Source] Update: DoD exposure data for EPA risk evaluation - EPA request for additional information.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5178607

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Exposure Concentration (Unit):	Provides personal breathing zone monitoring data.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	DOD service branches use OSHA and NIOSH methods and DOD methods, which are expected to be equivalent to OSHA or NIOSH methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	U.S. based exposure data
	Metric 3:	Applicability	Medium	× 2	4	The DOD data include occupational conditions of use within the scopes of the chemicals, although additional uses potentially outside of scope may also be included. However, some occupational scenarios are not clear and cannot be clearly mapped to conditions of use within scope.
	Metric 4:	Temporal Representativeness	High	× 2	2	Approximately 82 percent of the samples provided by DOD are not more than 10 years old.
	Metric 5:	Sample Size	High	× 1	1	Individual measurements are provided so the sample sets can be fully statistically characterized.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	DOD data include sample type (PBZ), sample time, process duration and frequency, and workshift duration. Process and worker job descriptions are provided, but inconsistent in detail and often lack sufficient clarity.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	DOD data do not discuss variability or uncertainty.

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Source Citation:	Defense Occupational and Environmental Health Readiness System - Industrial Hygiene (DOEHRS-IH). 2018. Email between DOD and EPA: RE: [Non-DoD Source] Update: DoD exposure data for EPA risk evaluation - EPA request for additional information.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	5178607

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:	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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5071458

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Brake Servicing Model
Life Cycle Description (Subcategory of Use):	Brake Servicing Model
Route of Exposure:	Used to develop an inhalation exposure model.

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	The CARB data are specific to brake servicing and include halogenated solvent aerosol brake cleaners, which is applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	The report was published in 2000, the manufacturer and facility surveys were conducted in 1997 and 1998, and site visits were conducted circa 1998. All less than 20 years old (from 2016).
	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:	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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5071458

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:	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; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2591566

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Brake Servicing Model
Life Cycle Description (Subcategory of Use):	Brake Servicing Model
Route of Exposure:	Used to develop an inhalation exposure model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Air ventilation rate data are at least in part based on European data (but may also include U.S. data).
	Metric 3:	Applicability	High	× 2	2	Ventilation rate data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Paper published in 2009; data are based on 2006 and 1991 data. Data are in part more than than 20 years old (as measured from 2016).
	Metric 5:	Sample Size	Medium	× 1	2	Ventilation rate provided as range with uncertain distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability of ventilation rates provided, but uncertainty not discussed.
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:	Golsteijn, L.,Huizer, D.,Hauck, M.,van Zelm, R.,Huijbregts, M. A.. 2014. Including exposure variability in the life cycle impact assessment of indoor chemical emissions: the case of metal degreasing. Environment International.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2537636

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Brake Servicing Model
Life Cycle Description (Subcategory of Use):	Brake Servicing Model
Route of Exposure:	Used to develop an inhalation exposure model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Air ventilation rate data based on European data.
	Metric 3:	Applicability	High	× 2	2	Ventilation rate data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Ventilation rate data based on 2012 and 2003 sources. Article published in 2014.
	Metric 5:	Sample Size	Medium	× 1	2	Ventilation rate provided as range with uncertain distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability of ventilation rates provided, but uncertainty 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:	Hellweg, S; Demou, E; Bruzzi, R; Meijer, A; Rosenbaum, RK; Huijbregts, MA; Mckone, TE. 2009. Integrating human indoor air pollutant exposure within Life Cycle Impact Assessment. Environmental Science and Technology.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	634560

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Brake Servicing Model
Life Cycle Description (Subcategory of Use):	Brake Servicing Model
Route of Exposure:	Used to develop an inhalation exposure model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Air ventilation rate data are at least in part based on European data (but may also include U.S. data).
	Metric 3:	Applicability	High	× 2	2	Ventilation rate data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Low	× 2	6	Paper published in 2009; data appear to be from sources dating from 1989 to 1993.
	Metric 5:	Sample Size	Medium	× 1	2	Ventilation rate provided as range with uncertain distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability of ventilation rates provided, but uncertainty not discussed.
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:	Scientific Consulting Group, Inc.. 2013. Final peer review comments for the OPPT trichloroethylene (TCE) draft risk assessment.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3044932

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Brake Servicing Model
Life Cycle Description (Subcategory of Use):	Brake Servicing Model
Route of Exposure:	Used to develop an inhalation exposure model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Peer reviewer does not provide data sources or techniques used to arrive at ventilation rate estimates.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Peer reviewer's experience appears to be U.S. based.
	Metric 3:	Applicability	High	× 2	2	Ventilation rate data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Time period of the peer reviewer's observations not provided, but not expected to be outdated.
	Metric 5:	Sample Size	Medium	× 1	2	Ventilation rate provided as range with uncertain distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Underlying data sources not transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability of ventilation rates provided, but uncertainty not discussed.
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:	Blando, J. D.,Schill, D. P.,De La Cruz, M. P.,Zhang, L.,Zhang, J.. 2010. Preliminary study of propyl bromide exposure among New Jersey dry cleaners as a result of a pending ban on perchloroethylene. Journal of the Air and Waste Management Association.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1619253

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models (number of loads per day).

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Studies New Jersey (U.S.) based dry cleaners.
	Metric 3:	Applicability	High	× 2	2	Observed dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Paper published in 2010, site visits conducted circa 2009; less than 10 years old.
	Metric 5:	Sample Size	High	× 1	1	Limited number of samples, but individual data points allow characterization of distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discusses uncertainty and variability in observed data.
Overall Quality Determination†			High		1.0	

* 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:	California Air Resources Board. 2006. California Dry Cleaning Industry Technical Assessment Report. Stationary Source Division, Emissions Assessment Branch.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5176440

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model3) Spot Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models.

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	Observed dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Report published in 2006, data surveyed and collected circa 2003; more than 10 years old but less than 20 years.
	Metric 5:	Sample Size	High	× 1	1	Collected data are generally provided with robust statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discusses uncertainty and variability in observed data.
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:	Niosh,. 1997. Hazard control: Control of exposure to perchloroethylene in commercial drycleaning (machine design) (HC 18).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3974935

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH is expected to use reliable data collection and survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaning machines.
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Document published in 1997; more than 10 years old but generally less than 20 years.
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides results but generally does not provide data sources, methods, or assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Generally does not discuss 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:	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; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3044963

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH is expected to use reliable data collection and survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaning machines.
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Document published in 1997; more than 10 years old but generally less than 20 years.
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides results but generally does not provide data sources, methods, or assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Generally does not discuss 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:	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; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970603

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	NIOSH is expected to use reliable data collection methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaning machines.
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Site visits conducted in 2008; less than 10 years old (from 2016).
	Metric 5:	Sample Size	High	× 1	1	Limited number of samples, but individual data points allow characterization of distribution.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Discusses variability among the different sites.
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:	Whittaker, SG; Johanson, CA. 2011. A profile of the dry cleaning industry in King County, Washington: Final report. Local Hazardous Waste Management Program in King County.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827371

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Dry Cleaning Release Model2) Dry Cleaning Exposure Model3) Spot Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure and release models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	King County has used reliable data collection and survey methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaning machines (Washington).
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Site visits conducted in 2009-2010, with surveys conducted afterwards; less than 10 years old (from 2016).
	Metric 5:	Sample Size	High	× 1	1	Collected data are generally provided with robust statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article fully documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discusses uncertainty and variability in observed data.
Overall Quality Determination†			High		1.0	

* 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:	Institute for Research and Technical Assistance. 2007. Spotting chemicals: Alternatives to perchloroethylene and trichloroethylene in the textile cleaning industry.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045700

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Spot Cleaning Exposure Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CalEPA and EPA funded project expected to use reliable data collection methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaning machines (California)
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Report published in 2007; less than 10 years old (from 2016).
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides results but generally does not provide data sources, methods, or assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Generally does not discuss 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:	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; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	632592

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Spot Cleaning Exposure Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data based on German dry cleaners (OECD country).
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Work based on dissertation published in 2003. More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	× 1	2	The various data elements used from the study are presented mostly as ranges or averages.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability in parameter values discussed, but no discussion of uncertainties.
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:	Morris, M; Wolf, K. 2005. Evaluation of New and Emerging Technologies for Textile Cleaning. Institute for Research and Technical Assistance.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5176441

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Spot Cleaning Exposure Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	CARB, CalEPA, and EPA funded project expected to use reliable data collection methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaners (California).
	Metric 3:	Applicability	High	× 2	2	Spot cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Report published in 2005; more than 10 but less than 20 years old.
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides results but generally does not provide data sources, methods, or assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Generally does not discuss 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:	Blando, J; Schill, D; De La Cruz, P; Zhang, L; Zhang, J. 2009. PERC ban among dry cleaners leads to 1-bromopropane exposures with alternative "green" solvent.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045119

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Dry Cleaning Exposure Model
Route of Exposure:	Provides data to estimate 1-BP based spot cleaner use rate in inhalation exposure model.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	State and academic research expected to use reliable data collection methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaners (New Jersey).
	Metric 3:	Applicability	High	× 2	2	Spot cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Data collected from 2008 to 2009; less than 10 years old (from 2016).
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion of variability and uncertainty in 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:	Enviro Tech International. 2013. Drysolv spray testing & spotter. Material safety data sheet.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045693

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Spot Cleaning Exposure Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides 1-BP concentration in 1-BP based spot cleaner.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Product manufacturer is expected to know the composition of their products.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Product available for sale in U.S.
	Metric 3:	Applicability	High	× 2	2	Spot cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	SDS issue date is 2013; less than 10 years old.
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All needed metadata are provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Range in concentration provided; unclear if this represents variability or uncertainty in the concentration.
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:	Eastern Research Group Inc.. 2005. [Letter from Eric Goehl and Jennifer O'Neil, Eastern Research group, Inc, to Dry Cleaning Docket, Subject: Background information document].
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045690

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Dry Cleaning Exposure Model
Route of Exposure:	Provides data used in inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Data collected in support of EPA rulemaking.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaners.
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Data are more than 10 years old but less than 20 years old.
	Metric 5:	Sample Size	High	× 1	1	Individual data points provided.
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	Medium	× 1	2	Limited discussion of variability and uncertainty in results.
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:	Massachusetts Department of Environmental Protection. 2013. Alternative dry cleaning technologies comparative analysis worksheet.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045045

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	1) Spot Cleaning Exposure Model2) Dry Cleaning Exposure Model
Route of Exposure:	Provides data on 1-BP based spot cleaner for use in inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	State and TURI expected to use reliable data collection methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Data are based on U.S. dry cleaners.
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	High	× 2	2	Worksheet published in 2013; less than 10 years old.
	Metric 5:	Sample Size	Low	× 1	3	Data characterized with no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Provides results but generally does not provide data sources, methods, or assumptions.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	Generally does not discuss 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:	Von Grote, J. 2003. Occupational Exposure Assessment in Metal Degreasing and Dry Cleaning -Influences of Technology Innovation and Legislation. A dissertation submitted to the Swiss Federal Institute of Technology Z"rich for the degree of Doctor of Natural Sciences. Swiss Federal Institute of Technology Z"rich.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	5176439

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Dry Cleaning Exposure Model
Route of Exposure:	Cited for:1) Residual solvent on garments2) Duration of finishing/ pressing3) Size of machine cylinders

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Academic PhD dissertation expected to use reliable data collection and analysis methods.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data based on German dry cleaners (OECD country).
	Metric 3:	Applicability	High	× 2	2	Dry cleaning data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Dissertation published in 2003. More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	× 1	2	The various data elements used from the study are presented mostly as ranges or averages.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability in parameter values discussed, but no discussion of uncertainties.
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:	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; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3045042

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Vapor and Cold Degreasing Exposure Models
Route of Exposure:	Cited for far-field volumes for inhalation exposure models.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Article is published in peer-reviewed scientific journal.
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Data based on German facilities (OECD country).
	Metric 3:	Applicability	High	× 2	2	Degreasing facility data are applicable to the scope of the model.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Work based on dissertation published in 2003. More than 10 but less than 20 years old.
	Metric 5:	Sample Size	Medium	× 1	2	The various data elements used from the study are presented mostly as ranges or averages.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Sources are cited, but does not provide details on how reported values were derived from cited sources.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Variability in parameter values discussed, but no discussion of uncertainties.
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.

Facility

Source Citation:	U.S. EPA. 2017. Public database 2016 chemical data reporting (May 2017 release).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827204

EXTRACTION

Parameter	**Data**
Life Cycle Stage:	Manufacture and Import
Life Cycle Description (Subcategory of Use):	Manufacture and Import
Total Annual U.S. Volume (and percent of PV):	Provides U.S. domestic manufactured and imported PV and percent PV to downstream uses.
Number of Sites:	Provides number of manufacturing and import sites.
Possible Physical Form:	Provides physical form.
Chemical Concentration:	Provides concentration.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	EPA is a trusted source.
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	CDR is U.S. based data.
	Metric 3:	Applicability	High	× 2	2	CDR covers chemical manufacturers and importers, which are in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	× 2	2	EPA used data from the 2016 CDR, which includes data reported for 2015.
	Metric 5:	Sample Size	Medium	× 1	2	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	CDR data do not address variability or uncertainty in submitter provided data.

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Source Citation:	U.S. EPA. 2017. Public database 2016 chemical data reporting (May 2017 release).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827204

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.